IN THE UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF OHIO
EASTERN DIVISION

Terves LLC,	)	
	)	Case No. 1:19-cv-1611-DCN
Plaintiff,	)	
	)	Judge Donald C. Nugent
vs.	)	
	)	
Yueyang Aerospace New Materials Co. Ltd. et al.,	)	
	)	
	)	
Defendants.	)	

Terves LLC's Final Validity Contentions

Terves, LLC ("Terves") makes the following final validity and enforceability contentions in accordance with L.P.R. 3.7 and 3.10. Terves expressly reserves the right to amend and supplement these contentions based on further disclosures, discovery, or any subsequent Court order.

I. Terves' Responsive Validity Charts (L.P.R. 3.7(a))

Pursuant to L.P.R. 3.7(a), Exhibits A-B set forth Terves' response to the charts provided by defendants Ecometal Inc. and Nick Yuan ("Ecometal") pursuant to L.P.R. 3.5, and identify each limitation of each asserted claim that is missing from the asserted prior art. No response: (1) to Ecometal's invalidity contentions under 35 U.S.C. § 112, or (2) as to whether the cited information is "prior art" is required under L.P.R. 3.7.

The law presumes that each claim of U.S. Patent Nos. 10,329,653 and 10,689,740 ("Terves Patents") is valid. As set forth in the attached charts, the alleged prior art identified by Ecometal in its invalidity contentions does not disclose each element of any claim of the Terves Patents. Additionally, Dr. Lee Swanger's Rebuttal Report of October 6,

2020 details why Ecometal's invalidity theories fail and is thus incorporated in its entirety by reference. Ecometal's invalidity contentions under 35 U.S.C. §§ 102 and 103 therefore cannot overcome the statutory presumption of validity for any claim of the Terves Patents.

L.P.R. 3.7 does not require Terves to admit, deny or otherwise respond to any other matter relating to validity set forth in Ecometal's invalidity contentions. The absence of a specific response to any statement in Ecometal's invalidity contentions, including with respect to whether the art Ecometal has identified qualifies as prior art and whether a motivation exists to combine references in the manner Ecometal proposes, therefore does not constitute an admission by Terves for any purpose.

II. Responsive Statement Regarding Enforceability (L.P.R. 3.7(b))

Ecometal's invalidity and unenforceability contentions admit that Ecometal does not assert that the Terves Patents are unenforceable for any reason. A responsive statement by Terves regarding enforceability therefore is not required under L.P.R. 3.7(b).

III. Supporting Documents (L.P.R. 3.7(c))

Pursuant to L.P.R. 3.7(c), Terves will make available all documents supporting L.P.R. 3.7(a)-(b) disclosures to the extent they exist and have not been produced.

Respectfully submitted,

Dated: July 20, 2021

s/David B. Cupar

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Counsel for Terves LLC

CERTIFICATE OF SERVICE

A copy of *Terves LLC's Final Validity Contentions* was served by email on July 20, 2021, to the following counsel for defendants Ecometal Inc. and Nick Yuan:

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/s/ David B. Cupar
One of the Attorneys for Terves LLC

'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
1. A magnesium composite that includes in situ precipitation of galvanically-active intermetallic phases to enable controlled dissolution of said magnesium composite,	Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." ¶ 0026, ll. 1-3. Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β ($Mg_{17}Al_{12}$) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion			The preamble does not identify any limitations so that none of the references cited by defendants are relevant. Alternatively, none of the cited references disclose a magnesium composite that includes in situ precipitation of galvanically- active intermetallic phases to enable controlled dissolution of said magnesium composite.

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	decomposition of magnesium alloy." ¶ 0026. A POSITA in August 2014 would have understood this disclosure of "intermetallic composite micro-particles" to be a reference to intermetallic precipitate. A POSITA reading the Xiao reference in April 2014 would have recognized that the precipitation of galvanically-active intermetallic phases ("micro-batteries") are naturally and necessarily generated by the in situ reaction between magnesium and any and all of the disclosed metal additives forming in situ precipitate. Thus, this claim element was disclosed by Xiao.			
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag…**	**Terves' Response**
said magnesium composite comprising a mixture of magnesium or a magnesium alloy and an additive material,	Xiao discloses "first loading pure magnesium and pure aluminum into a smelting furnace . . . next loading pure zinc and an [sic] intermediate alloys of trace element components into a resulting magnesium-aluminum alloy melt after melting." ¶ 0022. Xiao discloses that "Al-Fe … Al-Ni … Al-Cu … Al- Ag … Al-Zr … and … Al-Ti intermediate alloy[s], are heated to dry and then added to the			None of the references recite this limitation.

	magnesium-aluminum alloy melt." Id. at ¶ 0023. These intermediate alloys meet the parties' agreed construction of "additive material," i.e., "a material that is added" (ECF #89). The addition of these intermediate alloys to the melted magnesium alloy necessarily results in a mixture of the additive material and magnesium alloy.			
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
said additive material having a greater melting point temperature than a solidus temperature of said magnesium	Using a typical phase diagram, a POSITA in April 2014 would have readily determined that the solidus temperature of magnesium is the temperature at which a metal first begins to melt during heating and not necessarily when the metal is completely liquidus. A POSITA would also use this phase diagram to find the solidus temperature of the magnesium-aluminum alloy disclosed in Xiao to be in a range of 650°C for pure magnesium and down to 437°C for aluminum additions in the range of 13 wt% to 25% and even up to 40 wt%. The POSITA using typical phase diagrams for each of the additive materials (here the Al-Fe, Al-Ni, Al-Cu, Al-Ag, Al-Zr, Al-Ti "intermediate			None of the references recite this limitation.

	alloys" disclosed in Xiao) would be able to readily determine the melting point temperature (i.e. "temperature at which liquid is first formed" (Court's construction (ECF #89))) for each intermediate alloy. (¶ 0023). For example, the Al-Fe phase diagram (Ex. 1205) shows a variable melting point temperature ranging from 1538°C (pure iron) down to 655°C for a eutectic temperature between about 63 wt% aluminum to near 99 wt% aluminum. The Al-Ni phase diagram (Ex. 1206) shows a variable melting point temperature that ranges from 1640°C down to 640°C depending upon the alloy content. The Al-Cu (Ex. 1207) phase diagram shows a variable melting point temperature ranging from 548°C up to 1084°C depending upon the alloy mixture. A POSITA in April 2014 would have readily determined the specific melting temperature of a specific alloy mixture based on these phase diagrams. Xiao discloses a variety of Al-Fe, Al-Ni, Al-Cu, Al-Ag, Al-Zr, Al-Ti alloy mixtures with a variety of constituencies. For instance, Xiao specifically teaches in Example 7 that: The composition of the alloy and the respective percentages by weight are as follows: 25% Al-10% Zn-1% Fe-0.5% Ni-0.1% Cu- 0.5% Ti-0.05% Zr, and the remainder is Mg. 0058-59.			

	Xiao teaches that the magnesium alloy of Example 7, as a whole, ends up with the maximum amount of aluminum (i.e. 25 wt%) taught as being within the invention of Xiao (see, ¶ 0026). Xiao specifically discloses—with respect to Example 7—that portions of that aluminum content are added into a magnesium-aluminum melt as an Al-Fe intermediate alloy, an Al-Ni intermediate alloy, an Al-Cu intermediate alloy, an Al-Ag intermediate alloy, an Al-Zr intermediate alloy, and an Al-Ti intermediate alloy. ¶ 0060. By converting weight percentages to grams and calculating mass balances, a POSITA would first determine the relative concentrations of the pure magnesium and pure aluminum initially loaded into the smelting furnace in order to determine its solidus temperature. As a result, a POSITA would have understood in April 2014 that Example 7 of Xiao includes 62.85 total grams of magnesium. The following intermediate alloy compositions were chosen for the initial mass balance calculations: Al-Fe (30 wt% Fe), Al-Ni (45 wt% Ni), Al-Cu (40 wt% Cu), Al-Ti (10 wt% Ti), Al-Zr (20 wt% Zr) alloy mixtures. A POSITA in April 2014 would have performed the initial mass balances, included as Exhibit 1216, on these compositions. Using these initially			

	selected alloy compositions would have resulted in 7.79 grams of Aluminum being added as components of the intermediate alloys. Since Example 7 of Xiao calls for a total of 25 grams (i.e. 25 wt%) of Aluminum, 17.21 grams of Aluminum would have had to have been initially loaded into the smelting furnace in Example 7 along with the 62.85 grams of magnesium (see calculation above). Thus, the initial melt of Example 7 (using the intermediate alloys selected) would have had a composition of 78.5 wt% Mg and 21.5 wt% Al. A POSITA in April 2014 would have next consulted the Mg-Al phase diagram to determine that the solidus temperature of that initial magnesium alloy (i.e. 78.5 wt% Mg and 21.5 wt% Al) would be 437 °C. A POSITA would also consult the relevant phase diagram to determine the melting point temperature of the various additive materials disclosed in Xiao. Id. at ¶ 122. An aluminum-iron alloy with 30 wt% iron would have a melting point temperature of 655 °C, an aluminum-nickel alloy with 45 wt% Ni would have a melting point temperature of 854 °C, an aluminum-copper alloy with 40 wt% Cu would have a melting point temperature of 548°C, an aluminum-titanium alloy with 10 wt% Ti would have a melting point temperature of 665°C, and an aluminum-zirconium			

	alloy with 20 wt% Zr would have a melting point temperature of 661°C. Thus, each of these additive materials from Example 7 of Xiao (with the constituencies selected above) would have had a greater melting point temperature than the solidus temperature (i.e. 437°C) of the magnesium-aluminum alloy (78.5 wt% Mg and 21.5 wt% Al) calculated as the amount of pure aluminum and magnesium initially loaded into the smelting furnace in Example 7. A POSITA in April 2014 would have recognized that other compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys having greater melting point temperatures than the solidus temperature of initial magnesium alloy loaded in the various disclosures of Xiao. Thus, Xiao discloses all of the limitations of this claim element.			
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
said additive material constituting about 0.05 wt %-45 wt % of said mixture,	Claim 1 of Xiao discloses: a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%, the remainder is Mg, and a sum of the weight percentages			None of the references recite this limitation.

	of the components is 100%." Claim 2 discloses: a "magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%." These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (¶ 0023) and particularly described in association with Example 7 of Xiao (Id. at ¶¶ 0057–0060) for which a POSITA could calculate the specific weight percentage (ranges) of each additive material or secondary metal. In doing so, a POSITA would determine that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other			

	disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. Accordingly, this claim element was disclosed by Xiao.			
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said additive material forming precipitant in said magnesium composite,	Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes “the β ($Mg_{17}Al_{12}$) phase and eutectic phase on the grain boundary of the magnesium alloy,” and “the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro- batteries] greatly accelerate the corrosion decomposition of magnesium alloy.” Id. These elements are among the claimed “secondary metals” disclosed by Xiao. Thus, all of the limitations of this claim element are disclosed by Xiao.			None of the references recite this limitation.

said additive material includes one or more metals selected from the group consisting of copper, nickel, iron, and cobalt,	Xiao teaches the use of a variety of metals as additive materials. See, e.g., ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ." Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including, in particular, copper, nickel, and iron, among other metals. Thus, Xiao discloses a number of metal additives, including copper, nickel, and iron and, hence fully discloses all of the limitations of these claim elements.			None of the references recite this limitation.
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said magnesium composite has a dissolution rate of at least 5 mg/cm2/hr. in 3 wt % KCI water mixture at 90°C.	A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates ("decomposition rates") because the units of measurement are the units used by POSITAs to measure dissolution rates. The disclosed table provides seven examples (excluding			None of the references recite this limitation.

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	the comparative [prior art] example). ¶ 0064. Xiao provides dissolution rates in g/cm2/hr, while the claims of the '653 Patent express dissolution rates in mg/cm2/hr. A POSITA would have known converting between g/cm2/hr to mg/cm2/hr, merely requires multiplication by 1,000. Thus, each of Xiao's seven examples (excluding the comparative [prior art] example) has a dissolution rate of at least three times the claimed "at least 5 mg/cm2/hr in 3 wt.% KCl water" at both 70°C or 93°C (with Example 7 being more than seven times that floor). A POSITA in April 2014 would have recognized that the dissolution rate of the examples in Xiao would necessarily have been well above the claimed floor of "at least of 5 mg/cm2/hr" at the claimed 90°C.			
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2. The magnesium composite as defined in claim 1, wherein said magnesium alloy includes over 50 wt % magnesium and one or more metals selected	Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." ¶ 0026, ll. 1-3. Claim 1 of Xiao discloses a "magnesium alloy, comprising the components at the weight			None of the references recite this limitation.

from the group consisting of aluminum, boron, bismuth, zinc, zirconium, and manganese.	percentages as follows: Al: 13 to 25%, Zn: 2 to 15%; the remainder is Mg, and a sum of the weight percentages of the components is 100%." Claim 1. Thus, Xiao discloses a range of magnesium 54.5-85 wt%, which overlaps and covers much of the claimed range set forth in these claim elements. Xiao teaches 0.05-0.5 wt% zirconium and 2-15 wt% zinc. A claim is invalid as anticipated when it is in Markush form and a prior art reference disclosed one of the claimed elements. See Fresenius USA, Inc. v. Baxter Int'l, Inc., 582 F.3d 1288, 1298 (Fed. Cir. 2009). See also Abbott Labs. v. Baxter Pharm. Prods., Inc., 334 F.3d 1274, 1280 (Fed.Cir.2003); Schering Corp. v. Geneva Pharms., Inc., 339 F.3d 1373, 1380 (Fed.Cir.2003); Thus, Xiao teaches all of these claim limitations.			
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
3. The magnesium composite as defined in claim 1, wherein said magnesium alloy includes over 50 wt % magnesium and one or more	Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." ¶ 0026, ll. 1-3. Claim 1 of Xiao discloses a "magnesium alloy, comprising the			None of the references recite this limitation.

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metals selected from the group consisting of aluminum in an amount of about 0.5-10 wt %, zinc in amount of about 0.1-3 wt %, zirconium in an amount of about 0.01-1 wt %, manganese in an amount of about 0.15-2 wt %, boron in amount of about 0.0002-0.04 wt %, and bismuth in amount of about 0.4-0.7 wt %.	components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%; the remainder is Mg, and a sum of the weight percentages of the components is 100%." Claim 1. Thus, Xiao discloses a range of magnesium 54.5-85 wt%, which overlaps and covers much of the claimed range set forth in these claim elements. This claim element would be anticipated solely by the zirconium concentrations falling within the 0.01-3 wt% range. Claim 3 also requires, in addition to a similar zirconium concentration to the Markush claims, a zinc concentration of 0.1-3 wt%. Xiao teaches 0.05-0.5 wt% zirconium, which touches and covers at least a portion of these claimed ranges. Xiao similarly teaches 2-15 wt% zinc, which covers much of the claimed (0.1-3 wt%) zinc concentration. A claim is invalid as anticipated when it is in Markush form and a prior art reference disclosed one of the claimed elements. See Fresenius USA, Inc. v. Baxter Int'l, Inc., 582 F.3d 1288, 1298 (Fed. Cir. 2009). See also Abbott Labs. v. Baxter Pharm. Prods., Inc., 334 F.3d 1274, 1280 (Fed.Cir.2003); Schering Corp. v. Geneva Pharms., Inc., 339 F.3d 1373, 1380 (Fed.Cir.2003); Thus, Xiao teaches all of these claim limitations.			

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4. The magnesium composite as defined in claim 1, wherein said additive material includes nickel,	Xiao discloses a “magnesium alloy…and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy…” ¶ 0026, ll. 1-3. Xiao teaches the use of a variety of metals as additive materials. See, e.g., ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may “further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . .” Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including, in particular, nickel, among other metals. Thus, Xiao discloses a number of metal additives, including nickel, and hence fully discloses all of the limitations of this claim element.			None of the references recite this limitation.
said nickel constitutes about 0.05-35 wt % of	Claim 1 of Xiao discloses: a “magnesium alloy, comprising the components at the weight			None of the references recite this limitation.

said magnesium composite,	percentages as follows: Al: 13 to 25%, Zn: 2 to 15%, the remainder is Mg, and a sum of the weight percentages of the components is 100%." Claim 2 discloses: a "magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%." These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (¶ 0023) and particularly described in association with Example 7 of Xiao (Id. at ¶¶ 0057–0060) for which a POSITA could calculate the specific weight percentage (ranges) of each additive material or secondary metal. In doing so, a POSITA would determine that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other			

	intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 35 wt% of the mixture. Accordingly, this claim element was disclosed by Xiao.			
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said nickel forms galvanically-active in situ precipitate in said magnesium composite.	Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β ($Mg_{17}Al_{12}$) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." *Id.* These elements are among the claimed "secondary metals" disclosed by Xiao. Thus, all of the limitations of			None of the references recite this limitation.

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	this claim element are disclosed by Xiao.			
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5. The magnesium composite as defined in claim 1, wherein said additive material includes copper,	Xiao discloses a “magnesium alloy…and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy…” ¶ 0026, ll. 1-3. Xiao teaches the use of a variety of metals as additive materials. See, e.g., ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may “further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . .” *Id.* at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including, in particular, copper, among other metals. Thus, Xiao discloses a number of metal additives, including copper, and hence fully discloses all of the limitations of these claim elements.			None of the references recite this limitation.

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said copper constitutes about 0.05-35 wt % of said magnesium composite,	Claim 1 of Xiao discloses: a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%, the remainder is Mg, and a sum of the weight percentages of the components is 100%." Claim 2 discloses: a "magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%." These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (¶ 0023) and particularly described in association with Example 7 of Xiao (*Id.* at ¶¶ 0057–0060) for which a POSITA could calculate the specific weight percentage (ranges) of each additive material or secondary metal. In doing so, a POSITA would determine that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the			None of the references recite this limitation.

	aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 35 wt% of the mixture. Accordingly, this claim element was disclosed by Xiao.			
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said copper forms galvanically-active in situ precipitate in said magnesium composite.	Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes “the β ($Mg_{17}Al_{12}$) phase and eutectic phase on the grain boundary of the magnesium alloy,” and “the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large			None of the references recite this limitation.

	amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." Id. These elements are among the claimed "secondary metals" disclosed by Xiao. Thus, all of the limitations of this claim element are disclosed by Xiao.			
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
7. The magnesium composite as defined in claim 1, where said magnesium composite is subjected to a deformation processing to reduce grain size of said magnesium composite, increase tensile yield strength of said magnesium composite, increase elongation of said magnesium composite, or combinations thereof.			As set forth in Ground I, supra, Xiao already discloses each and every element of the magnesium composition of Claim 1. Xiao does not disclose subjecting that magnesium composite to deformation processing. Hassan explicitly discloses deformation processing. In particular, Hassan discloses that the deposited magnesium ingots may then be subjected to secondary processing. For example, Hassan teaches that the nickel-reinforced magnesium ingots are machined and hot extruded to obtain rods of 8 mm diameter. *Id.* Analysis of the composite of Hassan "showed the reduction in the size of elemental nickel particulates in the extruded composites" (see Table 1 (from Hassan (above)). In other words,	None of the references recite this limitation.

			the extrusion in Hassan resulted in a reduction of grain size of the magnesium composite. A POSITA in April 2014 would have been motivated to combine the disclosure of Xiao with this disclosure of deformation processing in Hassan rendering Claim 7 obvious. Accordingly, Claim 7 should be found obvious over Xiao in view of Hassan.	
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
9. The magnesium composite as defined in claim 1, wherein a dissolution rate of said magnesium composite is about 5-325 mg/cm2/hr. in 3 wt % KCl water mixture at 90°C.	A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates ("decomposition rates") because the units of measurement are the units used by POSITAs to measure dissolution rates. The disclosed table provides seven examples (excluding the comparative [prior art] example). ¶ 0064. Xiao provides dissolution rates in g/cm2/hr, while the claims of the '653 Patent express dissolution rates in mg/cm2/hr. A POSITA would have known converting between g/cm2/hr to mg/cm2/hr, merely requires multiplication by 1,000. Thus, each of Xiao's seven examples (excluding the comparative [prior art] example) has a dissolution rate of at least three times the claimed			None of the references recite this limitation.

	"about 5-325 mg/cm2/hr in 3 wt.% KCl water" at both 70°C or 93°C (with Example 7 being more than seven times that floor). A POSITA in April 2014 would have recognized that the dissolution rate of the examples in Xiao would necessarily have been well above the claimed floor of "about 5-325 mg/cm2/hr" at the claimed 90°C.			
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
12. A magnesium composite that includes in situ precipitation of galvanically-active intermetallic phases to enable controlled dissolution of said magnesium composite comprising a mixture of a magnesium or a magnesium alloy and an additive material,			Xiao discloses a "magnesium alloy…and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy…" ¶ 0026, ll. 1-3. Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β ($Mg_{17}Al_{12}$) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so	None of the references recite this limitation.

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			that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." ¶ 0026. A POSITA in August 2014 would have understood this disclosure of "intermetallic composite micro-particles" to be a reference to intermetallic precipitate. A POSITA reading the Xiao reference in April 2014 would have recognized that the precipitation of galvanically-active intermetallic phases ("micro-batteries") are naturally and necessarily generated by the in situ reaction between magnesium and any and all of the disclosed metal additives forming in situ precipitate. Thus, this claim element was disclosed by Xiao. Xiao discloses "first loading pure magnesium and pure aluminum into a smelting furnace . . . next loading pure zinc and an [sic] intermediate alloys of trace element components into a resulting magnesium-aluminum alloy melt after melting." ¶ 0022. Xiao discloses that "Al-Fe ... Al-Ni ... Al-Cu ... Al- Ag ... Al-Zr ... and ... Al-Ti intermediate alloy[s], are heated to dry and then added to the magnesium-aluminum alloy melt." Id. at ¶ 0023. The addition	

			of these intermediate alloys to the melted magnesium alloy necessarily results in a mixture of the additive material and magnesium alloy.	
’653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
said additive material having a greater melting point temperature than a solidus temperature of said magnesium,			Using a typical phase diagram, a POSITA in April 2014 would have readily determined that the solidus temperature of magnesium is the temperature at which a metal first begins to melt during heating and not necessarily when the metal is completely liquidus. Diagram omitted. Ex. 1213. A POSITA would also use this phase diagram to find the solidus temperature of the magnesium-aluminum alloy disclosed in Xiao to be in a range of 650°C for pure magnesium and down to 437°C for aluminum additions in the range of 13 wt% to 25% and even up to 40 wt%. The POSITA using typical phase diagrams for each of the additive materials (here the Al-Fe, Al-Ni, Al-Cu, Al-Ag, Al-Zr, Al-Ti “intermediate alloys” disclosed in Xiao) would be able to readily determine the melting point temperature (i.e. “temperature at which liquid is first formed”	None of the references recite this limitation.

			(Court's construction (ECF #89))) for each intermediate alloy. (¶ 0023). For example, the Al-Fe phase diagram (Ex. 1205) shows a variable melting point temperature ranging from 1538°C (pure iron) down to 655°C for a eutectic temperature between about 63 wt% aluminum to near 99 wt% aluminum. The Al-Ni phase diagram (Ex. 1206) shows a variable melting point temperature that ranges from 1640°C down to 640°C depending upon the alloy content. The Al-Cu (Ex. 1207) phase diagram shows a variable melting point temperature ranging from 548°C up to 1084°C depending upon the alloy mixture. A POSITA in April 2014 would have readily determined the specific melting temperature of a specific alloy mixture based on these phase diagrams. Xiao discloses a variety of Al-Fe, Al-Ni, Al-Cu, Al-Ag, Al-Zr, Al-Ti alloy mixtures with a variety of constituencies. For instance, Xiao specifically teaches in Example 7 that: The composition of the alloy and the respective percentages by weight are as follows: 25% Al-10% Zn-1% Fe-0.5% Ni-0.1% Cu- 0.5% Ti-0.05% Zr, and the remainder is Mg.	

			¶ 0058-59. Xiao teaches that the magnesium alloy of Example 7, as a whole, ends up with the maximum amount of aluminum (i.e. 25 wt%) taught as being within the invention of Xiao (see, ¶ 0026). Xiao specifically discloses—with respect to Example 7—that portions of that aluminum content are added into a magnesium-aluminum melt as an Al-Fe intermediate alloy, an Al-Ni intermediate alloy, an Al-Cu intermediate alloy, an Al-Ag intermediate alloy, an Al-Zr intermediate alloy, and an Al-Ti intermediate alloy. ¶ 0060. By converting weight percentages to grams and calculating mass balances, a POSITA would first determine the relative concentrations of the pure magnesium and pure aluminum initially loaded into the smelting furnace in order to determine its solidus temperature. As a result, a POSITA would have understood in April 2014 that Example 7 of Xiao includes 62.85 total grams of magnesium. The following intermediate alloy compositions were chosen for the initial mass balance calculations: Al-Fe (30 wt% Fe), Al-Ni (45 wt% Ni), Al-Cu (40 wt% Cu), Al-Ti (10 wt% Ti), Al-Zr (20 wt% Zr) alloy mixtures. A POSITA in April 2014 would have performed the initial	

			mass balances, included as Exhibit 1216, on these compositions. Using these initially selected alloy compositions would have resulted in 7.79 grams of Aluminum being added as components of the intermediate alloys. Since Example 7 of Xiao calls for a total of 25 grams (i.e. 25 wt%) of Aluminum, 17.21 grams of Aluminum would have had to have been initially loaded into the smelting furnace in Example 7 along with the 62.85 grams of magnesium (see calculation above). Thus, the initial melt of Example 7 (using the intermediate alloys selected) would have had a composition of 78.5 wt% Mg and 21.5 wt% Al. A POSITA in April 2014 would have next consulted the Mg-Al phase diagram to determine that the solidus temperature of that initial magnesium alloy (i.e. 78.5 wt% Mg and 21.5 wt% Al) would be 437 °C. A POSITA would also consult the relevant phase diagram to determine the melting point temperature of the various additive materials disclosed in Xiao. *Id.* at ¶ 122. An aluminum-iron alloy with 30 wt% iron would have a melting point temperature of 655 °C, an aluminum-nickel alloy with 45 wt% Ni would have a melting point temperature of 854 °C, an aluminum-copper alloy	

			with 40 wt% Cu would have a melting point temperature of 548°C, an aluminum-titanium alloy with 10 wt% Ti would have a melting point temperature of 665°C, and an aluminum-zirconium alloy with 20 wt% Zr would have a melting point temperature of 661°C. Thus, each of these additive materials from Example 7 of Xiao (with the constituencies selected above) would have had a greater melting point temperature than the solidus temperature (i.e. 437°C) of the magnesium-aluminum alloy (78.5 wt% Mg and 21.5 wt% Al) calculated as the amount of pure aluminum and magnesium initially loaded into the smelting furnace in Example 7. A POSITA in April 2014 would have recognized that other compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys having greater melting point temperatures than the solidus temperature of initial magnesium alloy loaded in the various disclosures of Xiao. Thus, Xiao discloses all of the limitations of this claim element.	

’653 Patent Claims	Anticipated by CN 103343271 A Xiao et al.	At Least Made Obvious By CN 103343271 A Xiao et al.	Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...	Terves’ Response
said composite including greater than 50 wt % magnesium,			Claim 1 of Xiao discloses a “magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%; the remainder is Mg, and a sum of the weight percentages of the components is 100%.” Claim 1. Thus, Xiao discloses a range of magnesium 54.5-85 wt%, which overlaps and covers much of the claimed ranges set forth in these claim elements.	None of the references recite this limitation.
said additive material constituting about 0.05-45 wt % of said magnesium composite,			Claim 1 of Xiao discloses: a “magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%, the remainder is Mg, and a sum of the weight percentages of the components is 100%.” Claim 2 discloses: a “magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%.” These metallic elements are found in the additive materials generally disclosed by Xiao (i.e.,	None of the references recite this limitation.

			intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (¶ 0023) and particularly described in association with Example 7 of Xiao (Id. at ¶¶ 0057–0060) for which a POSITA could calculate the specific weight percentage (ranges) of each additive material or secondary metal. In doing so, a POSITA would determine that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. Accordingly, this claim element was disclosed by Xiao.	

’653 Patent Claims	Anticipated by CN 103343271 A Xiao et al.	At Least Made Obvious By CN 103343271 A Xiao et al.	Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag…	Terves’ Response
said additive material having a melting point temperature that is 100°C. greater than a melting temperature of said magnesium or magnesium alloy,			A POSITA in April 2014 would have understood “melting temperature” in this claim element to be a reference to the smelting temperature or temperature of the melt when the additive material is being added to the magnesium or magnesium alloy, not the “melting point temperature” as that measurement is used for the additive material. Xiao generally discloses “loading pure magnesium and pure aluminum into a smelting furnace and increasing the temperature to 700 to 730 °C, next loading pure zinc and an [sic] intermediate alloys . . . into a resulting magnesium-aluminum alloy melt after melting and increasing the temperature to 740 to 780°C . . . .” ¶¶ 0021–0022; see also *Id.* at Claim 5 (“the melting temperature of the pure magnesium and pure aluminum is from 700 to 730 °C.”) Examples 1–7 of Xiao teach a range of smelting temperatures for the magnesium-aluminum alloy from 700°C (Example 1) to 730°C (Examples 2, 5, and 7). ¶¶ 0034–0060.	None of the references recite this limitation.

			The additive materials noted above are one or more of the intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ag, Al-Zr, Al-Ti. Id. at ¶ 0023. A POSITA using typical phase diagrams for each of these additive materials would be able to readily determine the melting point temperature. Example 7 of Xiao specifically discloses a melting or smelting temperature of 730°C. ¶ 0060. A POSITA in April 2014 would have recognized from Example 7 of Xiao that at least an aluminum-nickel additive having 45 wt% nickel has a melting point temperature of 854°C which is 100°C greater than the melting or smelting temperatures of the magnesium aluminum alloy used in Example 7 (i.e., 730°C) and otherwise taught generally by Xiao (i.e., 700-730°C). A POSITA in April 2014 would have also recognized that other intermediate alloy compositions could have fallen within the teachings of Example 7 and other disclosures of Xiao and resulted in Al-Fe, Al-Ni, and Al-Cu intermediate alloys that would have had melting point temperatures that were 100°C. greater than the smelting temperatures of the magnesium alloy generally taught by Xiao	

			(i.e., 700- 730°C). Thus, this claim element was disclosed by Xiao.	
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
said additive material including one or more metals selected from the group consisting of copper, nickel, cobalt, titanium, and iron,			Xiao teaches the use of a variety of metals as additive materials. See, e.g., ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ." Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including, in particular, copper, nickel, and iron, among other metals. Thus, Xiao discloses a number of metal additives, including copper, nickel, and iron and, hence fully discloses all of the limitations of these claim elements.	None of the references recite this limitation.
at least a portion of said additive material remaining unalloyed additive material,			Xiao discloses that "[e]lements such as Fe, Cu, Ni, Ag, etc., in the micro-particles." ¶ 0026. However, Xiao does not disclose whether any of the additive material remains "unalloyed".	None of the references recite this limitation.

			Hassan explicitly discloses that magnesium composites containing additive materials, such as nickel may remain unreacted. In particular, Hassan discloses that the [s]evere reaction between magnesium melt and nickel particulates during DMD processing led to the reduction of the particulate size and formation of Mg_2Ni intermetallics [13]. The results of quantitative determination of unreacted nickel (see Table I), microstructural characterization illustrating the presence of reaction products (see Fig. 1) and XRD results (see Table II) showing the presence of Mg_2Ni supports the experimental observations." Thus, Hassan specifically provides experimental data showing— under similar conditions of magnesium composite fabrication as those in Xiao—that some of the additives, particularly nickel, will remain unreacted and unalloyed. Given the motivation to combine Xiao with Hassan, a POSITA in April 2014 would have combined these two references thereby providing further rationale that a POSITA in April 2014 would find Claim 12 of the '653 Patent obvious.	

’653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag…**	**Terves’ Response**
said magnesium composite including in situ precipitation of galvanically-active intermetallic phases that includes said unalloyed additive material,			Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes “the β ($Mg_{17}Al_{12}$) phase and eutectic phase on the grain boundary of the magnesium alloy,” and “the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy.” *Id.* A POSITA in August 2014 would have understood this disclosure of “intermetallic composite micro-particles” to be a reference to intermetallic precipitate. As noted above, at least Fe, Cu, and Ni are “additive materials.” Consequently, the in-situ precipitation of galvanically-active	None of the references recite this limitation.

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			intermetallic phases will include one or more of these additive materials. Thus, Xiao discloses all of this claim limitation. Xiao discloses that "[e]lements such as Fe, Cu, Ni, Ag, etc., in the micro- particles." *Id.* at ¶ 0026. However, Xiao does not disclose whether any of the additive material remains "unalloyed". Hassan explicitly discloses that magnesium composites containing additive materials, such as nickel may remain unreacted. In particular, Hassan discloses that the [s]evere reaction between magnesium melt and nickel particulates during DMD processing led to the reduction of the particulate size and formation of Mg2Ni intermetallics [13]. The results of quantitative determination of unreacted nickel (see Table I), microstructural characterization illustrating the presence of reaction products (see Fig. 1) and XRD results (see Table II) showing the presence of Mg2Ni supports the experimental observations." Ex. 1007 at 2472. Thus, Hassan specifically provides experimental data showing— under similar conditions of magnesium composite fabrication as those in Xiao—that some of the additives,	

			particularly nickel, will remain unreacted and unalloyed. Given the motivation to combine Xiao with Hassan, a POSITA in April 2014 would have combined these two references thereby providing further rationale that a POSITA in April 2014 would find Claims 12 and 71 of the '653 Patent obvious.	
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
said magnesium composite has a dissolution rate of at least 5 mg/cm2/hr. in 3 wt % KCl water mixture at 90°C.			A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates ("decomposition rates") because the units of measurement are the units used by POSITAs to measure dissolution rates. The disclosed table provides seven examples (excluding the comparative [prior art] example). ¶ 0064. Xiao provides dissolution rates in g/cm2/hr, while the claims of the '653 Patent express dissolution rates in mg/cm2/hr. A POSITA would have known converting between g/cm2/hr to mg/cm2/hr, merely requires multiplication by 1,000. Thus, each of Xiao's seven examples (excluding the comparative [prior art] example) has a dissolution rate of at least	None of the references recite this limitation.

			three times the claimed "at least 5 mg/cm2/hr in 3 wt.% KCl water" at both 70°C or 93°C (with Example 7 being more than seven times that floor). A POSITA in April 2014 would have recognized that the dissolution rate of the examples in Xiao would necessarily have been well above the claimed floor of "at least of 5 mg/cm2/hr" at the claimed 90°C.	
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
13. The magnesium composite as defined in claim 12, wherein said additive material is added to said magnesium or magnesium alloy while said magnesium or magnesium alloy is at a temperature that is above said solidus temperature of said magnesium and a temperature that is less than a melting point of said additive			With respect to the additional limitations added by this dependent claim, Xiao discloses "first loading pure magnesium and pure aluminum into a smelting furnace, next loading pure zinc and an [sic] intermediate alloys . . . into a resulting magnesium-aluminum alloy melt after melting." Claim 4. Hassan, discloses, in particular, magnesium as a base material "and elemental nickel particulates of 99.9% purity (Johnson Matthey, MA, USA) with an average size of 29±19 μm were used as reinforcement phase" and that "[t]he synthesis of the composites involved superheating the magnesium turnings with reinforcement particulates (placed	None of the references recite this limitation.

material to form said mixture.			in multi-layer sandwich form) to 750°C under inert Ar gas atmosphere in a graphite crucible." *Id.* at p. 2468. A POSITA would have known in April 2014 that the melting point of pure magnesium is 650°C and the melting point of pure nickel is 1455°C using standard phase diagrams for Mg and Ni, respectively. Given these values and the disclosure in Hassan of heating only to 750°C, the combination of Xiao and Hassan necessarily teach the limitations of Claim 13.	
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
14. The magnesium composite as defined in claim 13, wherein said magnesium alloy includes over 50 wt % magnesium and one or more metals selected from the group consisting of aluminum in an amount of about 0.5-10 wt %, zinc in amount of about 0.1-3 wt %,			Xiao discloses a "magnesium alloy…and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy…" ¶ 0026, ll. 1–9. Claim 1 of Xiao discloses a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%; the remainder is Mg, and a sum of the weight percentages of the components is 100%." Xiao at Claim 1 (emphasis added). Dr. Medlin opines that a POSITA would have understood	None of the references recite this limitation.

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zirconium in an amount of about 0.01-1 wt %, manganese in an amount of about 0.15-2 wt %, boron in amount of about 0.0002-0.04 wt %, and bismuth in an amount of about 0.4-0.7 wt %.			that the total range of the non-magnesium elements disclosed in Claim 1 of Xiao is 15 to 40%, leaving 60-85 wt% for magnesium. A POSITA would also note Xiao's disclosure that the "Examples of Xiao disclose a range of magnesium from 54.5 wt% - 79.2 wt%." Id. Thus, Xiao discloses a range of magnesium 54.5-85 wt%, which overlaps and covers much of the claimed range. This claim element would be anticipated solely by the zirconium concentrations falling within the 0.01-1 and/or 0.01-3 wt% ranges. Claim 14 also requires, in addition to a similar zirconium concentration to the Markush claims, a zinc concentration of 0.1-3 wt%.	
<u>'653 Patent Claims</u>	**<u>Anticipated by CN 103343271 A Xiao et al.</u>**	**<u>At Least Made Obvious By CN 103343271 A Xiao et al.</u>**	**<u>Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...</u>**	**<u>Terves' Response</u>**
15. The magnesium composite as defined in claim 14, wherein said additive material includes nickel,			Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." ¶ 0026, ll. 1–9. Xiao teaches the use of a variety of metals as additive materials. See, *e.g.,* at ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e]	None of the references recite this limitation.

			trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . .” *Id.* at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. *Id.* at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including nickel, among other metals. ¶ 145. Thus, Xiao discloses a number of metal additives, including nickel, and hence fully discloses all of the limitations of these claim elements.	
’653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
said nickel constitutes about 0.05-35 wt % of said magnesium composite,			Claim 1 of Xiao discloses: a “magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%, the remainder is Mg, and a sum of the weight percentages of the components is 100%.” Claim 1. And Claim 2 discloses: a “magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti:	None of the references recite this limitation.

			0.05 to 0.5%; and a sum of the weight percentages of the components is 100%." *Id.* at Claim 2. These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (¶ 0023) and particularly described in association with Example 7 of Xiao (*Id.* at ¶¶ 0057–0060) for which a POSITA would calculate for Example 7 of Xiao the specific weight percentage (ranges) of each additive material or secondary metal. In particular, a POSITA would determine that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. *Id.* ¶ 122. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. Dr. Medlin expressed his opinion that a POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other	

			disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. *Id.* at ¶ 125. Accordingly, this claim element was disclosed by Xiao.	
’653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
said nickel forms galvanically-active in situ precipitate in said magnesium composite.			Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes “the β ($Mg_{17}Al_{12}$) phase and eutectic phase on the grain boundary of the magnesium alloy,” and “the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy.” *Id.* These elements are among the claimed “secondary metals” disclosed by Xiao. Thus, all of the	None of the references recite this limitation.

			limitations of this claim element are disclosed by Xiao.	
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
18. The magnesium composite as defined in claim 15, wherein a dissolution rate of said magnesium composite is at least 45 mg/cm2/hr. in 3 wt % KCl water mixture at 90°C. and up to 325 mg/cm2/hr. in 3 wt % KCl water mixture at 90°C.			A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates ("decomposition rates") because the units of measurement are the units used by POSITAs to measure dissolution rates. ¶ 129. The disclosed table provides seven examples (excluding the comparative [prior art] example). ¶ 0064. Xiao provides dissolution rates in g/cm2/hr, while the claims of the '653 Patent express dissolution rates in mg/cm2/hr. A POSITA would have known converting between g/cm2/hr to mg/cm2/hr, merely requires multiplication by 1,000. Six of the seven examples (excluding the comparative [prior art] example) provided in Xiao therefore discloses a dissolution rate of "at least 45 mg/cm2/hr in 3 wt % KCl water" and "up to 325 mg/cm2/hr in 3 wt % KCl water" at 93°C. Given that the dissolution rates of Xiao slightly above (i.e., 3°C above) 90°C are almost all above the claimed floor of "at	None of the references recite this limitation.

			least 45 mg/cm2/hr". As such, a POSITA in April 2014 would have expected the dissolution rate of the examples in Xiao at 90°C to also be necessarily above the claimed floor of "at least 45 mg/cm2/hr." Thus, this element is disclosed by Xiao.	
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
19. The magnesium composite as defined in claim 12, wherein said magnesium alloy includes over 50 wt % magnesium and one or more metals			Xiao discloses a "magnesium alloy…and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy…" ¶ 0026, ll. 1–9.	None of the references recite this limitation.
selected from the group consisting of aluminum in an amount of about 0.5-10 wt %, zinc in amount of about 0.1-6 wt %, zirconium in an amount of about 0.01-3 wt %, manganese in an amount of about 0.15-2 wt %, boron in amount of about			Claim 1 of Xiao discloses a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%; the remainder is Mg, and a sum of the weight percentages of the components is 100%." Claim 1. A POSITA would have understood that the total range of the non-magnesium elements disclosed in Claim 1 of Xiao is 15 to 40%, leaving 60-85 wt% for magnesium. A POSITA would also note that the	None of the references recite this limitation.

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0.0002-0.04 wt %, and bismuth in an amount of about 0.4-0.7 wt %.			"Examples of Xiao disclose a range of magnesium from 54.5 wt% - 79.2 wt%." *Id.* Thus, Xiao discloses a range of magnesium 54.5-85 wt%, which overlaps and covers much of the claimed range. This claim element would be anticipated solely by the zirconium concentrations falling within the 0.01-1 and/or 0.01-3 wt% ranges. Claim 14 also requires, in addition to a similar zirconium concentration to the Markush claims, a zinc concentration of 0.1-3 wt%.	
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag…**	**Terves' Response**
20. The magnesium composite as defined in claim 12, said additive material includes nickel,			Xiao discloses a "magnesium alloy…and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy…" ¶ 0026, ll. 1–9. Xiao teaches the use of a variety of metals as additive materials. See, *e.g.*, ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ." *Id.* at Claim 2. In addition, Example 7 of Xiao particularly	None of the references recite this limitation.

			discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. *Id.* at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including nickel, among other metals. Thus, Xiao discloses a number of metal additives, including nickel, and hence fully discloses all of the limitations of these claim elements.	
’653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
said nickel constitutes about 0.05-35 wt % of said magnesium composite,			Claim 1 of Xiao discloses: a “magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%, the remainder is Mg, and a sum of the weight percentages of the components is 100%.” Claim 1. And Claim 2 discloses: a “magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%.” *Id.* at Claim 2. These metallic elements are found in the additive materials generally	None of the references recite this limitation.

			disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (¶ 0023) and particularly described in association with Example 7 of Xiao (*Id.* at ¶¶ 0057–0060) for which a POSITA would calculate for Example 7 of Xiao the specific weight percentage (ranges) of each additive material or secondary metal. In particular, a POSITA would determine that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. *Id.* at ¶ 122. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. *Id.* at ¶ 125. Accordingly, this claim element was disclosed by Xiao.	

'653 Patent Claims	Anticipated by CN 103343271 A Xiao et al.	At Least Made Obvious By CN 103343271 A Xiao et al.	Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...	Terves' Response
said nickel forms galvanically-active in situ precipitate in said magnesium composite.			Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β ($Mg_{17}Al_{12}$) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." *Id.* These elements are among the claimed "secondary metals" disclosed by Xiao. Thus, all of the limitations of this claim element are disclosed by Xiao.	None of the references recite this limitation.

'653 Patent Claims	Anticipated by CN 103343271 A Xiao et al.	At Least Made Obvious By CN 103343271 A Xiao et al.	Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...	Terves' Response
23. The magnesium composite as defined in claim 12, wherein a dissolution rate of said magnesium composite is at least 45 mg/cm2/hr. in 3 wt % KCl water mixture at 90°C. and up to 325 mg/cm2/hr. in 3 wt % KCl water mixture at 90°C.			A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates ("decomposition rates") because the units of measurement are the units used by POSITAs to measure dissolution rates. The disclosed table provides seven examples (excluding the comparative [prior art] example). Xiao at ¶ 0064. Xiao provides dissolution rates in g/cm2/hr, while the claims of the '653 Patent express dissolution rates in mg/cm2/hr. A POSITA would have known converting between g/cm2/hr to mg/cm2/hr, merely requires multiplication by 1,000. Six of the seven examples (excluding the comparative [prior art] example) provided in Xiao therefore discloses a dissolution rate of "at least 45 mg/cm2/hr in 3 wt % KCl water" and "up to 325 mg/cm2/hr in 3 wt % KCl water" at 93°C. Given that the dissolution rates of Xiao slightly above (i.e., 3°C above) 90°C are almost all above the claimed floor of "at least 45 mg/cm2/hr". As such, a POSITA in April 2014 would have	None of the references recite this limitation.

			expected the dissolution rate of the examples in Xiao at 90°C to also be necessarily above the claimed floor of "at least 45 mg/cm2/hr." Ex. 1002 at ¶ 205. Thus, this element is disclosed by Xiao.	
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
25. A dissolvable magnesium alloy composite for use in a ball or other tool component in a well drilling or completion operation,			Xiao discloses that the cast magnesium alloy "can be used as a tripping ball material for a multi-stage sliding sleeve staged-fracturing technique." ¶ 0001. A POSITA would have understood that a tripping ball was a type of tool component in an oil well drilling operation.	The preamble does not identify any limitations so that none of the references cited by defendants are relevant. Alternatively, none of the cited references disclose A magnesium composite that includes in situ precipitation of galvanically- active intermetallic phases to enable controlled dissolution of said magnesium composite.
said dissolvable magnesium alloy composite comprising at least			Claim 1 of Xiao discloses a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to	None of the references recite this limitation.

85 wt % magnesium;			25%, Zn: 2 to 15%, the remainder is Mg, and a sum of the weight percentages of the components is 100%." A POSITA would have understood that the range of non-magnesium elements in Claim 1 leaves 60-85 wt% for magnesium. Thus, Xiao discloses a range of magnesium up to 85 wt%, which touches the claimed range (i.e. at least 85 wt% magnesium) set forth in this claim element. However, this leaves no room for any of the claimed additive materials. Xiao also discloses a prior art magnesium alloy represented by Mg-Al-Zn (with AZ91D magnesium alloy being the most widely used) wherein the "main components of this alloy and the respective weight percentages are as follows: Al 8.3 to 9.7, Zn 0.35 to 1.0, Mn 0.15 to 0.5, and the remainder [(i.e. 88.8 to 91.2 wt%)] is magnesium." *Id.* at ¶ 0003. Xiao also uses an AZ91D as a comparative example alloy, with a composition of 9 wt% Al, 1 wt% Zn, 0.3 wt% Zr, and 0.1 wt% Mn, with the remainder (i.e. 89.6 wt%) being magnesium. *Id.* at ¶ 0032. Xiao teaches a primary difference between this prior art and its novel magnesium alloy lies in the addition of metallic elements like Iron, Copper, and/or Nickel into the alloy. *Id.* at ¶ 0026	

			(“[e]lements such as Fe, Cu, Ni, Ag, etc., in the magnesium alloy can form a large number of intermetallic composite micro-particles, which can improve the corrosion performance of the magnesium alloy, thereby promoting the decomposition of the magnesium alloy”). The dissolution data in Xiao (¶ 0061) teaches that the addition of Iron, Copper, and/or Nickel (alongside the Aluminum, Zinc, Zirconium, and Manganese of the prior art AZ91D example) caused a surprisingly large increase in dissolution rates. Thus, Xiao, as a whole, teaches magnesium compositions with magnesium content above 85 wt% and “room” for the novel additive materials (i.e. “Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%” (Xiao at Claim 2)). Thus, Xiao fully discloses a range of magnesium of at least 85 wt %, touching and even overlapping the claimed range.	
’653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
one or more metals selected from the group consisting of 0.5-10			This claim element would be anticipated solely by the zirconium concentrations falling within the 0.01-3 wt% range.	None of the references recite this limitation.

wt % aluminum, 0.05-6 wt % zinc, 0.01-3 wt % zirconium, and 0.15-2 wt % manganese; and about 0.05-45 wt % of a secondary metal to form a galvanically-active intermetallic particle that promotes corrosion of said dissolvable magnesium alloy composite,			Claim 25 also requires, in addition to a similar zirconium concentration to the Markush claims, a zinc concentration of 0.05-6 wt%. Claim 1 of Xiao discloses "Al: 13 to 25%, Zn: 2 to 15%," and Claim 2 of Xiao discloses secondary metals of "Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%." Thus, Xiao teaches 0.05-0.5 wt% zirconium, which touches and covers at least a portion of these claimed ranges. Xiao similarly teaches 2-15 wt% zinc, which covers much of the claimed (0.05-6 wt%) zinc concentration. A claim is invalid as anticipated when it is in Markush form and a prior art reference disclosed one of the claimed elements. See *Fresenius USA, Inc. v. Baxter Int'l, Inc.*, 582 F.3d 1288, 1298 (Fed. Cir. 2009). See also *Abbott Labs. v. Baxter Pharm. Prods., Inc.*, 334 F.3d 1274, 1280 (Fed.Cir.2003); *Schering Corp. v. Geneva Pharms., Inc.*, 339 F.3d 1373, 1380 (Fed.Cir.2003); These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (¶ 0023) and particularly described in association with Example 7 of	

			Xiao (*Id.* at ¶¶ 0057–0060) for which a POSITA would calculate for Example 7 of Xiao the specific weight percentage (ranges) of each additive material or secondary metal. In particular, a POSITA would determine that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. Accordingly, this claim element was disclosed by Xiao.	

'653 Patent Claims	Anticipated by CN 103343271 A Xiao et al.	At Least Made Obvious By CN 103343271 A Xiao et al.	Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag…	Terves' Response
said secondary metal including one or more metals selected from the group consisting of copper, nickel, cobalt, titanium and iron,			Xiao teaches the use of a variety of metals as additive materials. See, e.g., ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ." *Id.* at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. *Id.* at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including, in particular, copper, nickel, and iron, among other metals. Thus, Xiao discloses a number of metal additives, including copper, nickel, and iron and, hence fully discloses all of the limitations of these claim elements.	None of the references recite this limitation.
said magnesium alloy composite has a dissolution rate of at least 5 mg/cm2/hr. in 3 wt % KCI water mixture at 90°C.			A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates ("decomposition rates") because the units of measurement are the units used by POSITAs to measure dissolution rates. The disclosed table provides seven	None of the references recite this limitation.

			examples (excluding the comparative [prior art] example). ¶ 0064. Xiao provides dissolution rates in g/cm2/hr, while the claims of the '653 Patent express dissolution rates in mg/cm2/hr. A POSITA would have known converting between g/cm2/hr to mg/cm2/hr, merely requires multiplication by 1,000. Thus, each of Xiao's seven examples (excluding the comparative [prior art] example) has a dissolution rate of at least three times the claimed "at least 5 mg/cm2/hr in 3 wt.% KCl water" at both 70°C or 93°C (with Example 7 being more than seven times that floor), a POSITA in April 2014 would have recognized that the dissolution rate of the examples in Xiao would necessarily have been well above the claimed floor of "at least of 5 mg/cm2/hr" at the claimed 90°C.	
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
26. The dissolvable magnesium alloy composite as defined in claim 25, wherein a				None of the references recite this limitation.

dissolution rate of said magnesium alloy composite is 100-325 mg/cm2/hr. in 3 wt % KCl water mixture at 90°C.				
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
27. The dissolvable magnesium composite as defined in claim 25, wherein said secondary metal includes nickel,			Xiao discloses a "magnesium alloy…and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy…" ¶ 0026, ll. 1–9. Xiao teaches the use of a variety of metals as additive materials. See, *e.g.*, ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ." *Id.* at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. *Id.* at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including nickel,	None of the references recite this limitation.

			among other metals. Thus, Xiao discloses a number of metal additives, including nickel, and hence fully discloses all of the limitations of these claim elements.	
’653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag…**	**Terves’ Response**
said nickel forms galvanically-active in situ precipitate in said magnesium composite.			Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes “the β ($Mg_{17}Al_{12}$) phase and eutectic phase on the grain boundary of the magnesium alloy,” and “the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy.” Id. These elements are among the claimed “secondary metals” disclosed by Xiao. Thus, all of the	None of the references recite this limitation.

			limitations of this claim element are disclosed by Xiao.	
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
29. A dissolvable magnesium alloy composite for use in a ball or other tool component in a well drilling or completion operation,	Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." ¶ 0026, ll. 1–9. Xiao discloses that the cast magnesium alloy "can be used as a tripping ball material for a multi-stage sliding sleeve staged-fracturing technique." ¶ 0001. A POSITA would have understood that a tripping ball was a type of tool component in an oil well drilling operation.			The preamble does not identify any limitations so that none of the references cited by defendants are relevant. Alternatively, none of the cited references disclose A magnesium composite that includes in situ precipitation of galvanically- active intermetallic phases to enable controlled dissolution of said magnesium composite.
said dissolvable magnesium alloy composite comprising 60-95 wt % magnesium; 0.01-1 wt % zirconium; and about 0.05-45 wt %	Claim 1 of Xiao discloses a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%; the remainder is Mg, and a sum of the weight percentages of the components is 100%." Xiao at Claim 1 (emphasis added). A POSITA would have understood that the total			None of the references recite this limitation.

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of a secondary metal	range of the non-magnesium elements disclosed in Claim 1 of Xiao is 15 to 40%, leaving 60-85 wt% for magnesium. Examples of Xiao disclose a range of magnesium from 54.5 wt% - 79.2 wt%. Thus, Xiao discloses a range of magnesium 54.5-85 wt%, which overlaps and covers much of the claimed ranges set forth in these claim elements. This claim element of Claim 29 would be anticipated solely by the zirconium concentrations falling within the 0.01-1 range. Claim 1 of Xiao discloses "Al: 13 to 25%, Zn: 2 to 15%," and Claim 2 of Xiao discloses secondary metals of "Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%." Thus, Xiao teaches 0.05-0.5 wt% zirconium, which touches and covers at least a portion of these claimed ranges. Xiao similarly teaches 2-15 wt% zinc, which covers much of the claimed (0.05-6 wt%) zinc concentration. A claim is invalid as anticipated when it is in Markush form and a prior art reference disclosed one of the claimed elements. See Fresenius USA, Inc. v. Baxter Int'l, Inc., 582 F.3d 1288, 1298 (Fed. Cir. 2009). See also Abbott Labs. v. Baxter Pharm. Prods., Inc., 334 F.3d 1274, 1280 (Fed.Cir.2003); Schering Corp. v.			

	Geneva Pharms., Inc., 339 F.3d 1373, 1380 (Fed.Cir.2003); These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (¶ 0023) and particularly described in association with Example 7 of Xiao (*Id.* at ¶¶ 0057–0060) for which a POSITA would calculate for Example 7 of Xiao the specific weight percentage (ranges) of each additive material or secondary metal. In particular, a POSITA would determine that the additive materials aluminum-iron with 30 wt% iron, aluminum- nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. Accordingly, this claim element was disclosed by Xiao.			

'653 Patent Claims	Anticipated by CN 103343271 A Xiao et al.	At Least Made Obvious By CN 103343271 A Xiao et al.	Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...	Terves' Response
to form a galvanically-active intermetallic particle that promotes corrosion of said dissolvable magnesium alloy composite,	Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β ($Mg_{17}Al_{12}$) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." *Id.* These elements are among the claimed "secondary metals" disclosed by Xiao. Thus, all of the limitations of this claim element are disclosed by Xiao.			None of the references recite this limitation.
said secondary metal including one or more metals selected from the group consisting of copper, nickel,	Xiao teaches the use of a variety of metals as additive materials. See, *e.g.*, ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to			None of the references recite this limitation.

cobalt, titanium and iron,	5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ."Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. *Id.* at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including, in particular, copper, nickel, and iron, among other metals. Thus, Xiao discloses a number of metal additives, including copper, nickel, and iron and, hence fully discloses all of the limitations of these claim elements.			

’653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
said magnesium alloy composite has a dissolution rate of at least 5 mg/cm2/hr. in 3 wt % KCl water mixture at 90°C.	A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates (“decomposition rates”) because the units of measurement are the units used by POSITAs to measure dissolution rates. The disclosed table provides seven examples (excluding the comparative [prior art] example). Xiao provides dissolution rates in g/cm2/hr, while the claims of the ’653 Patent express dissolution rates in mg/cm2/hr. A POSITA would have known that converting between g/cm2/hr to mg/cm2/hr, merely requires multiplication by 1,000.			None of the references recite this limitation.

	Thus, each of Xiao's seven examples (excluding the comparative [prior art] example) has a dissolution rate of at least three times the claimed "at least 5 mg/cm2/hr in 3 wt.% KCl water" at both 70°C or 93°C (with Example 7 being more than seven times that floor). A POSITA in April 2014 would have recognized that the dissolution rate of the examples in Xiao would necessarily have been well above the claimed floor of "at least of 5 mg/cm2/hr" at the claimed 90°C.			
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
30. The dissolvable magnesium alloy composite as defined in claim 29, wherein a dissolution rate of said magnesium alloy composite is 5-325 mg/cm2/hr. in 3 wt % KCl water mixture at 90°C.	A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates ("decomposition rates") because the units of measurement are the units used by POSITAs to measure dissolution rates. The disclosed table provides seven examples (excluding the comparative [prior art] example). Xiao at ¶ 0064. Xiao provides dissolution rates in g/cm2/hr, while the claims of the '653 Patent express dissolution rates in mg/cm2/hr. A POSITA would have known converting between g/cm2/hr to mg/cm2/hr, merely requires multiplication by 1,000.			None of the references recite this limitation.

	Thus, as each of Xiao's seven examples (excluding the comparative [prior art] example) has a dissolution rate within the claimed range of "about 5-325 mg/cm2/hr in 3 wt.% KCl water" at both 70°C or 93°C (with Example 7 being more than seven times that floor), a POSITA in April 2014 would have recognized that the dissolution rate of the examples in Xiao would necessarily have been well above the claimed floor of "about 5" mg/cm2/hr at the claimed 90°C.			
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
31. The dissolvable magnesium composite as defined in claim 29, wherein said secondary metal includes nickel,	Xiao discloses a "magnesium alloy…and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy…" Xiao at ¶ 0026, ll. 1–9. Xiao teaches the use of a variety of metals as additive materials. See, *e.g.*, *id.* at ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ."*Id.* at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-			None of the references recite this limitation.

	Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including nickel, among other metals. Thus, Xiao discloses a number of metal additives, including nickel, and hence fully discloses all of the limitations of this claim element.			
’653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
said nickel forms galvanically-active in situ precipitate in said magnesium composite.	Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao at ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes “the β ($Mg_{17}Al_{12}$) phase and eutectic phase on the grain boundary of the magnesium alloy,” and “the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy.” Id.			None of the references recite this limitation.

	These elements are among the claimed "secondary metals" disclosed by Xiao. Thus, all of the limitations of this claim element are disclosed by Xiao.			
’653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
33. A dissolvable magnesium alloy composite for use in a ball or other tool component in a well drilling or completion operation,		Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." Xiao at ¶ 0026, ll. 1–9. Xiao discloses that the cast magnesium alloy "can be used as a tripping ball material for a multi-stage sliding sleeve staged-fracturing technique." ¶ 0001. A POSITA would have understood that a tripping ball was a type of tool component in an oil well drilling operation.		None of the references recite this limitation.
said dissolvable magnesium alloy composite comprising 60-95 wt % magnesium; 0.5-10 wt % aluminum; 0.05-6		Claim 1 of Xiao discloses a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%; the remainder is Mg, and a sum		None of the references recite this limitation.

wt % zinc; 0.15-2 wt % manganese; and about 0.05-45 wt % of a secondary metal		of the weight percentages of the components is 100%." Xiao at Claim 1 (emphasis added).A POSITA would have understood that the total range of the non-magnesium elements disclosed in Claim 1 of Xiao is 15 to 40%, leaving 60-85 wt% for magnesium. Examples of Xiao disclose a range of magnesium from 54.5 wt% - 79.2 wt%." *Id.* Thus, Xiao discloses a range of magnesium 54.5-85 wt%, which overlaps and covers much of the claimed ranges set forth in these claim elements. Claim 2 discloses: a "magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%." *Id.* at Claim 2. These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe,		

		Al-Ni, Al-Cu, Al-Ti) (Xiao at ¶ 0023) and particularly described in association with Example 7 of Xiao (*Id.* at ¶¶ 0057–0060) for which a POSITA would calculate for Example 7 of Xiao the specific weight percentage (ranges) of each additive material or secondary metal. In particular, a POSITA would have determined that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni,		

		and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. Accordingly, these claim elements are disclosed by Xiao. Claim 1 of Xiao discloses a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%, the remainder is Mg, and a sum of the weight percentages of the components is 100%." Xiao (emphasis added). A POSITA would have understood that the range of non-magnesium elements in Claim 1 leaves 60-85 wt% for magnesium. Thus, Xiao discloses a range of magnesium up to 85 wt%, which touches the claimed range (i.e. at least 85 wt% magnesium) set forth in these claim elements. However, this leaves no room for any of the claimed additive materials. Xiao also discloses a prior art magnesium alloy represented by Mg-Al-Zn (with AZ91D magnesium alloy being the most widely used) wherein the "main components of this alloy		

		and the respective weight percentages are as follows: Al 8.3 to 9.7, Zn 0.35 to 1.0, Mn 0.15 to 0.5, and the remainder [(i.e. 88.8 to 91.2 wt%)] is magnesium." Id. at ¶ 0003. Xiao also uses an AZ91D as a comparative example alloy, with a composition of 9 wt% Al, 1 wt% Zn, 0.3 wt% Zr, and 0.1 wt% Mn, with the remainder (i.e. 89.6 wt%) being magnesium. *Id.* at ¶ 0032. Xiao teaches a primary difference between this prior art and its novel magnesium alloy lies in the addition of metallic elements like Iron, Copper, and/or Nickel into the alloy. *Id.* at ¶ 0026 ("[e]lements such as Fe, Cu, Ni, Ag, etc., in the magnesium alloy can form a large number of intermetallic composite micro-particles, which can improve the corrosion performance of the magnesium alloy, thereby promoting the decomposition of the magnesium alloy"). The dissolution data in Xiao (Xiao at ¶ 0061) teaches that the addition of Iron, Copper, and/or Nickel		

		(alongside the Aluminum, Zinc, Zirconium, and Manganese of the prior art AZ91D example) caused a surprisingly large increase in dissolution rates. Thus, Xiao, as a whole, teaches magnesium compositions with magnesium content above 85 wt% and "room" for the novel additive materials (i.e. "Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%" (Xiao at Claim 2)). Thus, Xiao fully discloses a range of magnesium of at least 85 wt %, touching and even overlapping the claim range.		
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
to form a galvanically-active intermetallic particle that promotes corrosion of said dissolvable magnesium alloy composite,		Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao at ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy		None of the references recite this limitation.

		in terms of a cathode phase, which Xiao explains includes "the β ($Mg_{17}Al_{12}$) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." Id. These elements are among the claimed "secondary metals" disclosed by Xiao. Thus, all of the limitations of this claim element are disclosed by Xiao.		
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
said secondary metal including one or more metals selected from the group consisting of copper, nickel, cobalt, titanium and iron,		Xiao teaches the use of a variety of metals as additive materials. See, e.g., Xiao at ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe:		None of the references recite this limitation.

		0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ." Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al- Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including, in particular, copper, nickel, and iron, among other metals. Thus, Xiao discloses a number of metal additives, including copper, nickel, and iron and, hence fully discloses all of the limitations of these claim elements.		
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
said magnesium alloy composite has a dissolution rate of at least 5 mg/cm2/hr. in 3 wt % KCl water mixture at 90°C.		A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates ("decomposition rates") because the units of measurement are the units used by POSITAs to measure dissolution rates.		None of the references recite this limitation.

		The disclosed table provides seven examples (excluding the comparative [prior art] example). Xiao at ¶ 0064. Xiao provides dissolution rates in g/cm2/hr, while the claims of the '653 Patent express dissolution rates in mg/cm2/hr. A POSITA would have known converting between g/cm2/hr to mg/cm2/hr, merely requires multiplication by 1,000. Thus, as each of Xiao's seven examples (excluding the comparative [prior art] example) has a dissolution rate of at least three times the claimed "at least 5 mg/cm2/hr in 3 wt.% KCl water" at both 70°C or 93°C (with Example 7 being more than seven times that floor), a POSITA in April 2014 would have recognized that the dissolution rate of the examples in Xiao would necessarily have been well above the claimed floor of "at least of 5 mg/cm2/hr" at the claimed 90°C.		

’653 Patent Claims	Anticipated by CN 103343271 A Xiao et al.	At Least Made Obvious By CN 103343271 A Xiao et al.	Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...	Terves’ Response
34. The dissolvable magnesium alloy composite as defined in claim 33, wherein a dissolution rate of said magnesium alloy composite is 5-325 mg/cm'/hr. in 3 wt % KCl water mixture at 90°C.		A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates (“decomposition rates”) because the units of measurement are the units used by POSITAs to measure dissolution rates. The disclosed table provides seven examples (excluding the comparative [prior art] example). Xiao at ¶ 0064. Xiao provides dissolution rates in g/cm2/hr, while the claims of the ’653 Patent express dissolution rates in mg/cm2/hr. A POSITA would have known converting between g/cm2/hr to mg/cm2/hr, merely requires multiplication by 1,000. Thus, each of Xiao’s seven examples (excluding the comparative [prior art] example) has a dissolution rate within the claimed range of of at least three times the claimed “about 5-325 mg/cm2/hr in 3 wt.%		None of the references recite this limitation.

		KCl water" at both 70°C or 93°C (with Example 7 being more than seven times that floor), A POSITA in April 2014 would have recognized that the dissolution rate of the examples in Xiao would necessarily have been well above the claimed floor of "about 5" "about 5-325 mg/cm2/hr" at the claimed 90°C.		
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
35. The dissolvable magnesium composite as defined in claim 33, wherein said secondary metal includes nickel,		Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." Xiao at ¶ 0026, ll. 1–9. Xiao teaches the use of a variety of metals as additive materials. See, e.g., Xiao at ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ."Id.		None of the references recite this limitation.

		at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including nickel, among other metals. Thus, Xiao discloses a number of metal additives, including nickel, and hence fully discloses all of the limitations of these claim elements.		
’653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
said nickel forms galvanically-active in situ precipitate in said magnesium composite.		Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao at ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains		None of the references recite this limitation.

		includes "the β ($Mg_{17}Al_{12}$) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." Id. These elements are among the claimed "secondary metals" disclosed by Xiao. Thus, all of the limitations of this claim element are disclosed by Xiao.		
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
37. A dissolvable magnesium alloy composite for use in a ball or other tool component in a well drilling or completion operation,	Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." Xiao at ¶ 0026, ll. 1–9. Xiao discloses that the cast magnesium alloy "can be used as a tripping ball material for a multi-stage sliding sleeve staged-fracturing			None of the references recite this limitation.

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	technique." ¶ 0001. A POSITA would have understood that a tripping ball was a type of tool component in an oil well drilling operation. Thus, these claim elements were disclosed by Xiao.			
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
said dissolvable magnesium alloy composite comprising 60-95 wt % magnesium; 0.05-6 wt % zinc; 0.01-1 wt % zirconium;	Claim 1 of Xiao discloses a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%; the remainder is Mg, and a sum of the weight percentages of the components is 100%." Xiao at Claim 1 (emphasis added). A POSITA would have understood that the total range of the non-magnesium elements disclosed in Claim 1 of Xiao is 15 to 40%, leaving 60-85 wt% for magnesium. The examples of Xiao disclose a range of magnesium from 54.5 wt% - 79.2 wt%. Thus, Xiao discloses a range of magnesium 54.5-85 wt%, which overlaps and covers much of the claimed ranges set forth in these claim elements. Claim 2 discloses: a "magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of			None of the references recite this limitation.

	the components is 100%." Id. at Claim 2. These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (Xiao at ¶ 0023) and particularly described in association with Example 7 of Xiao (Id. at ¶¶ 0057–0060) for which a POSITA would calculate for Example 7 of Xiao the specific weight percentage (ranges) of each additive material or secondary metal. In particular, a POSITA would have determined that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. Accordingly,			

	these claim elements are disclosed by Xiao.			
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag…**	**Terves' Response**
and about 0.05-45 wt % of a secondary metal to form a galvanically-active intermetallic particle that promotes corrosion of said dissolvable magnesium alloy composite,	Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao at ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β ($Mg_{17}Al_{12}$) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." Id. These elements are among the claimed "secondary metals" disclosed by Xiao. Thus, all of the limitations of this claim element are disclosed by Xiao.			None of the references recite this limitation.
said secondary metal including one or more metals selected	Xiao teaches the use of a variety of metals as additive materials. See, e.g., Xiao at ¶ 0026. For instance, Xiao claims that the novel			None of the references recite this limitation.

from the group consisting of copper, nickel, cobalt, titanium and iron,	magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ." Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including, in particular, copper, nickel, and iron, among other metals. Thus, Xiao discloses a number of metal additives, including copper, nickel, and iron and, hence fully discloses all of the limitations of these claim elements.			
’653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
said magnesium alloy composite has a dissolution rate of at least 5 mg/cm2/hr. in 3 wt % KCl water mixture at 90°C.	A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates ("decomposition rates") because the units of measurement are the units used by POSITAs to measure dissolution rates. The disclosed table provides seven examples (excluding the comparative [prior art] example). Xiao at ¶ 0064. Xiao provides dissolution rates in g/cm2/hr, while the claims of the ’653 Patent express dissolution rates			None of the references recite this limitation.

	in mg/cm2/hr. A POSITA would have known converting between g/cm2/hr to mg/cm2/hr, merely requires multiplication by 1,000. Thus, each of Xiao's seven examples (excluding the comparative [prior art] example) has a dissolution rate of at least three times the claimed "at least 5 mg/cm2/hr in 3 wt.% KCl water" at both 70°C or 93°C (with Example 7 being more than seven times that floor), a POSITA in April 2014 would have recognized that the dissolution rate of the examples in Xiao would necessarily have been well above the claimed floor of "at least of 5 mg/cm2/hr" at the claimed 90°C.			
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
38. The dissolvable magnesium alloy composite as defined in claim 37, wherein a dissolution rate of said magnesium alloy composite is 5-325 mg/cm2/hr. in 3 wt % KCl water mixture at 90°C.	A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates ("decomposition rates") because the units of measurement are the units used by POSITAs to measure dissolution rates. The disclosed table provides seven examples (excluding the comparative [prior art] example). Xiao at ¶ 0064. Xiao provides dissolution rates in g/cm2/hr, while the claims of the '653 Patent express dissolution rates in mg/cm2/hr. A POSITA would			None of the references recite this limitation.

	have known converting between g/cm2/hr to mg/cm2/hr, merely requires multiplication by 1,000. Thus, each of Xiao's seven examples (excluding the comparative [prior art] example) has a dissolution rate within the claimed range of of at least three times the claimed "about 5-325 mg/cm2/hr in 3 wt.% KCl water" at both 70°C or 93°C (with Example 7 being more than seven times that floor),a POSITA in April 2014 would have recognized that the dissolution rate of the examples in Xiao would necessarily have been well above the claimed floor of "about 5" "about 5-325 mg/cm2/hr" at the claimed 90°C.			
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
39. The dissolvable magnesium composite as defined in claim 37, wherein said secondary metal includes nickel,	Xiao discloses a "magnesium alloy…and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy…" Xiao at ¶ 0026, ll. 1–9. Xiao teaches the use of a variety of metals as additive materials. See, e.g., Xiao at ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%,			None of the references recite this limitation.

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	Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . .”Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including nickel, among other metals. Thus, Xiao discloses a number of metal additives, including nickel, and hence fully discloses all of the limitations of these claim elements.			

’653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag…**	**Terves’ Response**
said nickel forms galvanically-active in situ precipitate in said magnesium composite.	Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao at ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes “the β ($Mg_{17}Al_{12}$) phase and eutectic phase on the grain boundary of the magnesium alloy,” and “the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large			None of the references recite this limitation.

	amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." Id. These elements are among the claimed "secondary metals" disclosed by Xiao. Thus, all of the limitations of this claim element are disclosed by Xiao.			
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
41. A dissolvable magnesium alloy composite for use in a ball or other tool component in a well drilling or completion operation,	Xiao discloses a "magnesium alloy…and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy…" Xiao at ¶ 0026, ll. 1–9. Xiao discloses that the cast magnesium alloy "can be used as a tripping ball material for a multi-stage sliding sleeve staged-fracturing technique." ¶ 0001. A POSITA would have understood that a tripping ball was a type of tool component in an oil well drilling operation. Thus, these claim elements were disclosed by Xiao.			The preamble does not identify any limitations so that none of the references cited by defendants are relevant. Alternatively, none of the cited references disclose A magnesium composite that includes in situ precipitation of galvanically- active intermetallic phases to enable controlled dissolution of said magnesium composite.

'653 Patent Claims	Anticipated by CN 103343271 A Xiao et al.	At Least Made Obvious By CN 103343271 A Xiao et al.	Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...	Terves' Response
said dissolvable magnesium alloy composite comprising over 50 wt % magnesium; one or more metals selected from the group consisting of 0.5-10 wt % aluminum, 0.1-2 wt % zinc, 0.01-1 wt % zirconium, and 0.15-2 wt % manganese;	Claim 1 of Xiao discloses a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%; the remainder is Mg, and a sum of the weight percentages of the components is 100%." Xiao at Claim 1 (emphasis added). A POSITA would have understood that the total range of the non-magnesium elements disclosed in Claim 1 of Xiao is 15 to 40%, leaving 60-85 wt% for magnesium. The examples of Xiao disclose a range of magnesium from 54.5 wt% - 79.2 wt%. Thus, Xiao discloses a range of magnesium 54.5-85 wt%, which overlaps and covers much of the claimed ranges set forth in these claim elements. This claim element would be anticipated solely by the zirconium concentrations falling within the 0.01-1 and/or 0.01-3 wt% ranges. Claim 41 also requires, in addition to a similar zirconium concentration to the Markush claims, a zinc concentration of 0.1-2 wt%. Claim 1 of Xiao discloses "Al: 13 to 25%, Zn: 2 to 15%," and Claim 2 of Xiao discloses secondary metals of "Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight			

	percentages of the components is 100%." Thus, Xiao teaches 0.05-0.5 wt% zirconium, which touches and covers at least a portion of these claimed ranges. Xiao similarly teaches 2-15 wt% zinc, which covers much of the claimed (0.05-6 wt%) zinc concentration. A claim is invalid as anticipated when it is in Markush form and a prior art reference disclosed one of the claimed elements. See Fresenius USA, Inc. v. Baxter Int'l, Inc., 582 F.3d 1288, 1298 (Fed. Cir. 2009). See also Abbott Labs. v. Baxter Pharm. Prods., Inc., 334 F.3d 1274, 1280 (Fed.Cir.2003); Schering Corp. v. Geneva Pharms., Inc., 339 F.3d 1373, 1380 (Fed.Cir.2003); Thus, Xiao teaches all of these claim limitations. Claim 2 discloses: a "magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%." Id. at Claim 2. These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (Xiao at ¶ 0023) and particularly described in association with Example 7 of Xiao (Id. at ¶¶ 0057–0060) for which a POSITA would calculate for Example 7 of Xiao the			

	specific weight percentage (ranges) of each additive material or secondary metal. In particular, a POSITA would have determined that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. Accordingly, these claim elements are disclosed by Xiao. Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao at ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase,			

	which Xiao explains includes "the β ($Mg_{17}Al_{12}$) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro- batteries] greatly accelerate the corrosion decomposition of magnesium alloy." Id. These elements are among the claimed "secondary metals" disclosed by Xiao. Thus, all of the limitations of this claim element are disclosed by Xiao.			
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
and about 0.05-45 wt % of a secondary metal to form a galvanically-active intermetallic particle that promotes corrosion of said dissolvable magnesium alloy composite,	Xiao teaches the use of a variety of metals as additive materials. See, e.g., Xiao at ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ."Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these			None of the references recite this limitation.

	intermediate alloys contain metal, including, in particular, copper, nickel, and iron, among other metals. Thus, Xiao discloses a number of metal additives, including copper, nickel, and iron and, hence fully discloses all of the limitations of these claim elements.			
’653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
said secondary metal including one or more metals selected from the group consisting of copper, nickel and cobalt,	Xiao teaches the use of a variety of metals as additive materials. See, e.g., Xiao at ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may “further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . .”Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including, in particular, copper, nickel, and iron, among other metals. Thus, Xiao discloses a number of metal additives, including copper, nickel, and iron and, hence fully discloses all of the limitations of these claim elements.			None of the references recite this limitation.

'653 Patent Claims	Anticipated by CN 103343271 A Xiao et al.	At Least Made Obvious By CN 103343271 A Xiao et al.	Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...	Terves' Response
said magnesium alloy composite has a dissolution rate of at least 5 mg/cm2/hr. in 3 wt % KCl water mixture at 90°C.	A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates ("decomposition rates") because the units of measurement are the units used by POSITAs to measure dissolution rates. The disclosed table provides seven examples (excluding the comparative [prior art] example). Xiao at ¶ 0064. Xiao provides dissolution rates in g/cm2/hr, while the claims of the '653 Patent express dissolution rates in mg/cm2/hr. A POSITA would have known converting between g/cm2/hr to mg/cm2/hr, merely requires multiplication by 1,000. Thus, each of Xiao's seven examples (excluding the comparative [prior art] example) has a dissolution rate of at least three times the claimed "at least 5 mg/cm2/hr in 3 wt.% KCl water" at both 70°C or 93°C (with Example 7 being more than seven times that floor), a POSITA in April 2014 would have recognized that the dissolution rate of the examples in Xiao would necessarily have been well above the claimed floor of "at least of 5 mg/cm2/hr" at the claimed 90°C.			None of the references recite this limitation.

'653 Patent Claims	Anticipated by CN 103343271 A Xiao et al.	At Least Made Obvious By CN 103343271 A Xiao et al.	Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...	Terves' Response
42. The dissolvable magnesium alloy composite as defined in claim 41, wherein a dissolution rate of said magnesium alloy composite is 5-325 mg/cm2/hr. in 3 wt % KCl water mixture at 90°C.	A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates ("decomposition rates") because the units of measurement are the units used by POSITAs to measure dissolution rates. The disclosed table provides seven examples (excluding the comparative [prior art] example). Xiao at ¶ 0064. Xiao provides dissolution rates in g/cm2/hr, while the claims of the '653 Patent express dissolution rates in mg/cm2/hr. A POSITA would have known converting between g/cm2/hr to mg/cm2/hr, merely requires multiplication by 1,000. Thus, as each of Xiao's seven examples (excluding the comparative [prior art] example) has a dissolution rate within the claimed range of of at least three times the claimed "about 5-325 mg/cm2/hr in 3 wt.% KCl water" at both 70°C or 93°C (with Example 7 being more than seven times that floor), a POSITA in April 2014 would have recognized that the dissolution rate of the examples in Xiao would necessarily have been well above the claimed floor of "about 5" "about 5-325 mg/cm2/hr" at the claimed 90°C.			None of the references recite this limitation.

’653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
43. The dissolvable magnesium composite as defined in claim 41, wherein said secondary metal includes nickel,	Xiao discloses a “magnesium alloy…and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy…” Xiao at ¶ 0026, ll. 1–9. Xiao teaches the use of a variety of metals as additive materials. See, e.g., Xiao at ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may “further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . .”Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including, in particular, copper, nickel, and iron, among other metals. Thus, Xiao discloses a number of metal additives, including copper, nickel, and iron and, hence fully discloses all of the limitations of these claim elements.			None of the references recite this limitation.

'653 Patent Claims	Anticipated by CN 103343271 A Xiao et al.	At Least Made Obvious By CN 103343271 A Xiao et al.	Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...	Terves' Response
said nickel forms galvanically-active in situ precipitate in said magnesium composite.	Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao at ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β ($Mg_{17}Al_{12}$) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." Id. These elements are among the claimed "secondary metals" disclosed by Xiao. Thus, all of the limitations of this claim element are disclosed by Xiao.			None of the references recite this limitation.
45. A dissolvable magnesium alloy composite for use in a ball or other tool component in	Xiao discloses a "magnesium alloy…and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance			The preamble does not identify any limitations so that none of the references cited by

a well drilling or completion operation,	of the magnesium alloy…" Xiao at ¶ 0026, ll. 1–9. Xiao discloses that the cast magnesium alloy "can be used as a tripping ball material for a multi-stage sliding sleeve staged-fracturing technique." ¶ 0001. A POSITA would have understood that a tripping ball was a type of tool component in an oil well drilling operation. Thus, these claim elements were disclosed by Xiao. Claim 2 discloses: a "magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%." Id. at Claim 2. These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (Xiao at ¶ 0023) and particularly described in association with Example 7 of Xiao (Id. at ¶¶ 0057–0060) for which a POSITA would have calculated for Example 7 of Xiao the specific weight percentage (ranges) of each additive material or secondary metal . In particular, a POSITA would have determined that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt%			defendants are relevant. Alternatively, none of the cited references disclose A magnesium composite that includes in situ precipitation of galvanically- active intermetallic phases to enable controlled dissolution of said magnesium composite.

	copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. Accordingly, these claim elements are disclosed by Xiao.			
’653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
said dissolvable magnesium alloy composite comprising over 50 wt % magnesium; one or more metals selected from the group consisting of 0.1-3 wt % zinc, 0.01-1 wt % zirconium, 0.05-1 wt % manganese, 0.0002-0.04 wt %	Claim 1 of Xiao discloses a “magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%; the remainder is Mg, and a sum of the weight percentages of the components is 100%.” Xiao at Claim 1 (emphasis added). A POSITA would have understood that the total range of the non-magnesium elements disclosed in Claim 1 of Xiao is 15 to 40%, leaving 60-85 wt% for magnesium. The examples of Xiao			None of the references recite this limitation.

boron, and 0.4-0.7 wt % bismuth; and about 0.05-45 wt % of a secondary metal to form a galvanically-active intermetallic particle that promotes corrosion of said dissolvable magnesium alloy composite	disclose a range of magnesium from 54.5 wt% - 79.2 wt%. Id. Thus, Xiao discloses a range of magnesium 54.5-85 wt%, which overlaps and covers much of the claimed ranges set forth in these claim elements. All of the foregoing Markush claim elements (i.e., Claims 25, 41, 45, and 55) and this claim element of Claim 29 would be anticipated solely by the zirconium concentrations falling within the 0.01-1 and/or 0.01-3 wt% ranges. Claim 37 also requires, in addition to a similar zirconium concentration to the Markush claims, a zinc concentration of 0.05-6 wt%. Claim 1 of Xiao discloses "Al: 13 to 25%, Zn: 2 to 15%," and Claim 2 of Xiao discloses secondary metals of "Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%." Thus, Xiao teaches 0.05-0.5 wt% zirconium, which touches and covers at least a portion of these claimed ranges. Xiao similarly teaches 2-15 wt% zinc, which covers much of the claimed (0.05-6 wt%) zinc concentration. A claim is invalid as anticipated when it is in Markush form and a prior art reference disclosed one of the claimed elements. See Fresenius USA, Inc. v. Baxter Int'l, Inc., 582 F.3d 1288, 1298 (Fed. Cir. 2009). See also Abbott			

	Labs. v. Baxter Pharm. Prods., Inc., 334 F.3d 1274, 1280 (Fed.Cir.2003); Schering Corp. v. Geneva Pharms., Inc., 339 F.3d 1373, 1380 (Fed.Cir.2003); Thus, Xiao teaches all of these claim limitations. Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao at ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β ($Mg_{17}Al_{12}$) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro- batteries] greatly accelerate the corrosion decomposition of magnesium alloy." Id. These elements are among the claimed "secondary metals" disclosed by Xiao. Thus, all of the limitations of this claim element are disclosed by Xiao.			

'653 Patent Claims	Anticipated by CN 103343271 A Xiao et al.	At Least Made Obvious By CN 103343271 A Xiao et al.	Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...	Terves' Response
said secondary metal including one or more metals selected from the group consisting of copper, nickel, and cobalt,	Xiao teaches the use of a variety of metals as additive materials. See, e.g., Xiao at ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ." Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including, in particular, copper, nickel, and iron, among other metals. Thus, Xiao discloses a number of metal additives, including copper, nickel, and iron and, hence fully discloses all of the limitations of these claim elements.			None of the references recite this limitation.
said magnesium alloy composite has a dissolution rate of at least 5 mg/cm2/hr. in 3 wt % KCl water mixture at 90°C.	A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates ("decomposition rates") because the units of measurement are the units used by POSITAs to measure dissolution rates. The disclosed table provides seven examples (excluding			None of the references recite this limitation.

	the comparative [prior art] example). Xiao at ¶ 0064. Xiao provides dissolution rates in g/cm2/hr, while the claims of the ’653 Patent express dissolution rates in mg/cm2/hr. A POSITA would have known that converting between g/cm2/hr to mg/cm2/hr, merely requires multiplication by 1,000. Thus, each of Xiao’s seven examples (excluding the comparative [prior art] example) has a dissolution rate of at least three times the claimed “at least 5 mg/cm2/hr in 3 wt.% KCl water” at both 70°C or 93°C (with Example 7 being more than seven times that floor), a POSITA in April 2014 would have recognized that the dissolution rate of the examples in Xiao would necessarily have been well above the claimed floor of “at least of 5 mg/cm2/hr” at the claimed 90°C.			
’653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
46. The dissolvable magnesium alloy composite as defined in claim 45, wherein a dissolution rate of said magnesium alloy composite is 5-325 mg/cm2/hr.	A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates (“decomposition rates”) because the units of measurement are the units used by POSITAs to measure dissolution rates. The disclosed table provides seven examples (excluding			None of the references recite this limitation.

in 3 wt % KCl water mixture at 90°C.	the comparative [prior art] example). Xiao at ¶ 0064. Xiao provides dissolution rates in g/cm2/hr, while the claims of the '653 Patent express dissolution rates in mg/cm2/hr. A POSITA would have known converting between g/cm2/hr to mg/cm2/hr, merely requires multiplication by 1,000. Thus, as each of Xiao's seven examples (excluding the comparative [prior art] example) has a dissolution rate within the claimed range of "about 5-325 mg/cm2/hr in 3 wt.% KCl water" at both 70°C or 93°C (with Example 7 being more than seven times that floor), a POSITA in April 2014 would have recognized that the dissolution rate of the examples in Xiao would necessarily have been well above the claimed floor of "about 5" mg/cm2/hr at the claimed 90°C.			
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
47. The dissolvable magnesium composite as defined in claim 45, wherein said secondary metal includes nickel,	Xiao discloses a "magnesium alloy…and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy…" Xiao at ¶ 0026, ll. 1–9. Xiao teaches the use of a variety of metals as additive materials. See, e.g., Xiao at ¶ 0026. For instance,			None of the references recite this limitation.

	Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ."Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including nickel, among other metals. Thus, Xiao discloses a number of metal additives, including nickel, and hence fully discloses all of the limitations of these claim elements.			
<u>'653 Patent Claims</u>	**<u>Anticipated by CN 103343271 A Xiao et al.</u>**	**<u>At Least Made Obvious By CN 103343271 A Xiao et al.</u>**	**<u>Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...</u>**	**<u>Terves' Response</u>**
said nickel forms galvanically-active in situ precipitate in said magnesium composite.	Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao at ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β ($Mg_{17}Al_{12}$) phase and eutectic phase on the grain boundary of the			None of the references recite this limitation.

	magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." Id. These elements are among the claimed "secondary metals" disclosed by Xiao. Thus, all of the limitations of this claim element are disclosed by Xiao.			
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
49. A magnesium composite that includes in situ precipitation of galvanically-active intermetallic phases to enable controlled dissolution of said magnesium composite,	Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." Xiao at ¶ 0026, ll. 1–9. This disclosure meets the Patent Owner's construction of "magnesium composite." S Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains			The preamble does not identify any limitations so that none of the references cited by defendants are relevant. Alternatively, none of the cited references disclose A magnesium composite that includes in situ precipitation of galvanically- active intermetallic phases to enable controlled dissolution of said

	includes "the β ($Mg_{17}Al_{12}$) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." Xiao at ¶ 0026. A POSITA in August 2014 would have understood this disclosure of "intermetallic composite micro-particles" to be a reference to intermetallic precipitate. A POSITA reading the Xiao reference in April 2014 would have recognized that the precipitation of galvanically-active intermetallic phases ("micro-batteries") are naturally and necessarily generated by the in situ reaction between magnesium and any and all of the disclosed metal additives forming in situ precipitate. Thus, these claim elements were disclosed by Xiao.			magnesium composite.
’653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
said magnesium composite comprising a mixture of magnesium or a magnesium alloy	Xiao discloses "first loading pure magnesium and pure aluminum into a smelting furnace . . . next loading pure zinc and an [sic] intermediate alloys of trace element components into a resulting magnesium-			None of the references recite this limitation.

and an additive material,	aluminum alloy melt after melting." Xiao, at ¶ 0022. Xiao discloses that "Al-Fe ... Al-Ni ... Al-Cu ... Al- Ag ... Al-Zr ... and ... Al-Ti intermediate alloy[s], are heated to dry and then added to the magnesium-aluminum alloy melt." Id. at ¶ 0023. These intermediate alloys meet the Patent Owner's definition of "additive material," i.e., "a material that is added." The addition of these intermediate alloys to the melted magnesium alloy necessarily results in a mixture of the additive material and magnesium alloy.			
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
said additive material constituting about 0.05-45 wt % of said mixture,	Claim 1 of Xiao discloses: a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%, the remainder is Mg, and a sum of the weight percentages of the components is 100%." Xiao at Claim 1. And Claim 2 discloses: a "magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%." Id. at Claim 2. These metallic elements are found in the additive materials generally			None of the references recite this limitation.

	disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (Xiao at ¶ 0023) and particularly described in association with Example 7 of Xiao (Id. at ¶¶ 0057–0060) for which a POSITA would have calculated for Example 7 of Xiao the specific weight percentage (ranges) of each additive material or secondary metal. In particular, a POSITA would have determined that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. Accordingly, these claim elements are disclosed by Xiao.			

’653 Patent Claims	Anticipated by CN 103343271 A Xiao et al.	At Least Made Obvious By CN 103343271 A Xiao et al.	Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...	Terves’ Response
said additive material includes one or more metals selected from the group consisting of copper, nickel, titanium, iron, and cobalt,	Xiao teaches the use of a variety of metals as additive materials. See, e.g., Xiao at ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may “further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . .”Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including, in particular, copper, nickel, and iron, among other metals. Thus, Xiao discloses a number of metal additives, including copper, nickel, and iron and, hence fully discloses all of the limitations of these claim elements.			None of the references recite this limitation.
said magnesium composite including in situ precipitation of galvanically-active intermetallic phases that include said additive material,	Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao at ¶ 0026. Xiao explains the corrosion mechanism within a magnesium			None of the references recite this limitation.

	alloy in terms of a cathode phase, which Xiao explains includes "the β ($Mg_{17}Al_{12}$) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro- batteries] greatly accelerate the corrosion decomposition of magnesium alloy." Id. A POSITA in August 2014 would have understood this disclosure of "intermetallic composite micro-particles" to be a reference to intermetallic precipitate. As noted above, at least Fe, Cu, and Ni are "additive materials." Consequently, the in-situ precipitation of galvanically- active intermetallic phases will include one or more of these additive materials. Thus, Xiao discloses all of these claim limitations.			
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said additive material located in sufficient quantities in said galvanically-active intermetallic phases so as to	A POSITA would understand that the galvanically-active intermetallic phases ("composite micro-particles") have a morphology that enhances the corrosion dissolution rate of the alloy due to a larger number of smaller particles throughout the			None of the references recite this limitation.

obtain a composition and morphology of said galvanically-active intermetallic phases such that a galvanic corrosion rate along said galvanically-active intermetallic phases causes said magnesium composite to have a dissolution rate of at least at least 5 mg/cm2/hr. in 3 wt % KCl water mixture at 90°C.	microstructure. A POSITA would also understand the relationship between "composite micro-particles" and morphology of the galvanically-active intermetallic phases. Id. With respect to the "sufficient quantities" limitation, other claim limitations in Claims 49 and 73, define the weight percentage for the additive material as 0.05-45 wt% and about 0.05 wt%, respectively, which limitations are met by the teaching of Xiao with respect to four metals. In particular, Xiao discloses that "[e]lements such as Fe, Cu, Ni, Ag, etc., in the magnesium alloy can form a large number of intermetallic composite micro-particles, which can improve the corrosion performance of the magnesium alloy, thereby promoting the decomposition of the magnesium alloy." Id. ¶ 0026. And the magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%;..." Id. at Claim 2. As such, Xiao discloses four metals (i.e., Fe, Cu, Ni, and Ti) included within the list of "additive material" set forth in Claim Element M, supra. The claimed weight % quantities of the "additive material" of Claim Element I, supra, also overlap with the weight % ranges of Xiao's "trace elements". As such,			

	Claim Element P of claims 49 and 73—that the "additive materials" are located in "sufficient quantities"--is fully disclosed by Xiao's Claim 2 disclosure of "trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%…" Id. As such, Xiao's four metal "trace elements" are present in "sufficient quantities" to meet Claim Element P of claims 49 and 73. A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates ("decomposition rates") because the units of measurement are the units used by POSITAs to measure dissolution rates. The disclosed table provides seven examples (excluding the comparative [prior art] example). Xiao at ¶ 0064. Xiao provides dissolution rates in g/cm2/hr, while the claims of the '653 Patent express dissolution rates in mg/cm2/hr. A POSITA would have known converting between g/cm2/hr to mg/cm2/hr, merely requires multiplication by 1,000. Thus, as each of Xiao's seven examples (excluding the comparative [prior art] example) has a dissolution rate of at least three times the claimed "at least 5 mg/cm2/hr in 3 wt.% KCl water" at both 70°C or 93°C (with Example 7 being more than seven times that floor), a POSITA in April 2014 would have recognized			

	that the dissolution rate of the examples in Xiao would necessarily have been well above the claimed floor of "at least of 5 mg/cm2/hr" at the claimed 90°C. Id. at ¶ 132.			
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50. The magnesium composite as defined in claim 49, wherein said additive material includes one or more metals selected from the group consisting of copper, nickel, and cobalt.	Xiao teaches the use of a variety of metals as additive materials. See, e.g., Xiao at ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ."Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including, in particular, copper and nickel, among other metals. Ex. 1002 at ¶ 145. Thus, Xiao discloses a number of metal additives, including copper and nickel, and hence fully discloses all of the limitations of these claim elements.			None of the references recite this limitation.

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52. The magnesium composite as defined in claim 49, wherein said magnesium alloy includes over 50 wt % magnesium, and one or more metals selected from the group consisting of aluminum, boron, bismuth, zinc, zirconium, and manganese.	Xiao discloses a "magnesium alloy…and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy…" Xiao at ¶ 0026, ll. 1–9. Claim 1 of Xiao discloses a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%; the remainder is Mg, and a sum of the weight percentages of the components is 100%." Xiao at Claim 1 (emphasis added). A POSITA would have understood that the total range of the non-magnesium elements disclosed in Claim 1 of Xiao is 15 to 40%, leaving 60-85 wt% for magnesium. The examples of Xiao disclose a range of magnesium from 54.5 wt% - 79.2 wt%. *Id.* Thus, Xiao discloses a range of magnesium 54.5-85 wt%, which overlaps and covers much of the claimed range.			None of the references recite this limitation.
53. The magnesium composite as defined in claim 49, wherein said magnesium alloy	Claim 1 of Xiao discloses a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%; the remainder is Mg,			None of the references recite this limitation.

includes over 50 wt % magnesium, and one or more metals selected from the group consisting of aluminum in an amount of about 0.5-10 wt %, zinc in an amount of about 0.1-6 wt %, zirconium in an amount of about 0.01-3 wt %, manganese in an amount of about 0.15-2 wt %, boron in an amount of about 0.0002-0.04 wt %, and bismuth in amount of about 0.4-0.7 wt %.	and a sum of the weight percentages of the components is 100%." Xiao at Claim 1 (emphasis added). A POSITA would have understood that the total range of the non-magnesium elements disclosed in Claim 1 of Xiao is 15 to 40%, leaving 60-85 wt% for magnesium. The examples of Xiao disclose a range of magnesium from 54.5 wt% - 79.2 wt%. *Id.* Thus, Xiao discloses a range of magnesium 54.5-85 wt%, which overlaps and covers much of the claimed ranges set forth in these claim elements. This claim element would be anticipated solely by the zirconium concentrations falling within the 0.01-6 wt% range. Claim 3 also requires, in addition to a similar zirconium concentration to the Markush claims, a zinc concentration of 0.1-3 wt%.			
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54. The magnesium composite as defined in claim 49, wherein said magnesium alloy includes over 50 wt % magnesium, and one or more	Claim 1 of Xiao discloses a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%; the remainder is Mg, and a sum of the weight percentages of the components is 100%." Xiao at Claim 1 (emphasis added). A POSITA would have understood that the total			None of the references recite this limitation.

metals selected from the group consisting of aluminum in an amount of about 0.5-10 wt %, zinc in an amount of about 0.1-3 wt %, zirconium in an amount of about 0.01-1 wt %, manganese in an amount of about 0.15-2 wt %, boron in an amount of about 0.0002-0.04 wt %, and bismuth in an amount of about 0.4-0.7 wt %.	range of the non-magnesium elements disclosed in Claim 1 of Xiao is 15 to 40%, leaving 60-85 wt% for magnesium. The examples of Xiao disclose a range of magnesium from 54.5 wt% - 79.2 wt%. *Id.* Thus, Xiao discloses a range of magnesium 54.5-85 wt%, which overlaps and covers much of the claimed ranges set forth in these claim elements. This claim element would be anticipated solely by the zirconium concentrations falling within the 0.01-6 wt% range. Claim 3 also requires, in addition to a similar zirconium concentration to the Markush claims, a zinc concentration of 0.1-3 wt%.			
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55. The magnesium composite as defined in claim 49, wherein said magnesium alloy includes at least 85 wt % magnesium, and one or more metals selected from the group		Xiao discloses a "magnesium alloy…and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy…" Xiao at ¶ 0026, ll. 1–9. This claim element would be anticipated solely by the zirconium concentrations		None of the references recite this limitation.

consisting of 0.5-10 wt % aluminum, 0.05-6 wt % zinc, 0.01-3 wt % zirconium, and 0.15-2 wt % manganese.		falling within the 0.01-3 wt% range. Claim 55 also requires, in addition to a similar zirconium concentration to the Markush claims, a zinc concentration of 0.05-6 wt%. Claim 1 of Xiao discloses "Al: 13 to 25%, Zn: 2 to 15%," and Claim 2 of Xiao discloses secondary metals of "Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%." Thus, Xiao teaches 0.05-0.5 wt% zirconium, which touches and covers at least a portion of these claimed ranges. Xiao similarly teaches 2-15 wt% zinc, which covers much of the claimed (0.05-6 wt%) zinc concentration. A claim is invalid as anticipated when it is in Markush form and a prior art reference disclosed one of the claimed elements. See Fresenius USA, Inc. v. Baxter Int'l, Inc., 582 F.3d 1288, 1298 (Fed. Cir. 2009). See also Abbott Labs. v. Baxter Pharm. Prods., Inc., 334 F.3d 1274, 1280		

		(Fed.Cir.2003); Schering Corp. v. Geneva Pharms., Inc., 339 F.3d 1373, 1380 (Fed.Cir.2003); Thus, Xiao teaches all of these claim limitations. Claim 1 of Xiao discloses a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%, the remainder is Mg, and a sum of the weight percentages of the components is 100%." Xiao (emphasis added). A POSITA would have understood that the range of non-magnesium elements in Claim 1 leaves 60-85 wt% for magnesium. Thus, Xiao discloses a range of magnesium up to 85 wt%, which touches the claimed range (i.e. at least 85 wt% magnesium) set forth in these claim elements. However, this leaves no room for any of the claimed additive materials. Xiao also discloses a prior art magnesium alloy represented by Mg-Al-Zn (with AZ91D magnesium alloy being the most widely used) wherein the "main components of this alloy		

		and the respective weight percentages are as follows: Al 8.3 to 9.7, Zn 0.35 to 1.0, Mn 0.15 to 0.5, and the remainder [(i.e. 88.8 to 91.2 wt%)] is magnesium." Id. at ¶ 0003. Xiao also uses an AZ91D as a comparative example alloy, with a composition of 9 wt% Al, 1 wt% Zn, 0.3 wt% Zr, and 0.1 wt% Mn, with the remainder (i.e. 89.6 wt%) being magnesium. Id. at ¶ 0032. Xiao teaches a primary difference between this prior art and its novel magnesium alloy lies in the addition of metallic elements like Iron, Copper, and/or Nickel into the alloy. Id. at ¶ 0026 ("[e]lements such as Fe, Cu, Ni, Ag, etc., in the magnesium alloy can form a large number of intermetallic composite micro-particles, which can improve the corrosion performance of the magnesium alloy, thereby promoting the decomposition of the magnesium alloy"). The dissolution data in Xiao (Xiao at ¶ 0061) teaches that the addition of Iron, Copper, and/or Nickel		

		(alongside the Aluminum, Zinc, Zirconium, and Manganese of the prior art AZ91D example) caused a surprisingly large increase in dissolution rates. Thus, Xiao, as a whole, teaches magnesium compositions with magnesium content above 85wt% and "room" for the novel additive materials (i.e. "Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%" (Xiao at Claim 2)). Thus, Xiao fully discloses a range of magnesium of at least 85 wt %, touching and even overlapping the claim range. As for the other requirements of dependent claim 55, it has already been established in Ground I that Xiao discloses each and every element of independent claim 49. Ground I also establishes that Xiao discloses at least three of the metals overlapping the weight percentage ranges required by the Markush element of dependent claim 55 (i.e., 0.5-10 wt% aluminum, 0.05-6wt% zinc, and/or 0.01-3 wt% zirconium).		

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56. The magnesium composite as defined in claim 49, wherein said magnesium alloy includes 60-95 wt % magnesium and 0.01-1 wt % zirconium.	Claim 1 of Xiao discloses a “magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%; the remainder is Mg, and a sum of the weight percentages of the components is 100%.” Xiao at Claim 1 (emphasis added). A POSITA would have understood that the total range of the non-magnesium elements disclosed in Claim 1 of Xiao is 15 to 40%, leaving 60-85 wt% for magnesium. The examples of Xiao disclose a range of magnesium from 54.5 wt% - 79.2 wt%.” *Id.* Thus, Xiao discloses a range of magnesium 54.5-85 wt%, which overlaps and covers much of the claimed ranges set forth in these claim elements. Claim 2 discloses: a “magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%.” Id. at Claim 2. These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti)			None of the references recite this limitation.

	(Xiao at ¶ 0023) and particularly described in association with Example 7 of Xiao (Id. at ¶¶ 0057–0060) for which a POSITA would have calculated for Example 7 of Xiao the specific weight percentage (ranges) of each additive material or secondary metal. In particular, a POSITA would have determined that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. Accordingly, these claim elements are disclosed by Xiao.			

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57. The magnesium composite as defined in claim 56, wherein said magnesium alloy further includes 0.05-6 wt % zinc.	Claim 1 of Xiao discloses a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%; the remainder is Mg, and a sum of the weight percentages of the components is 100%." Xiao at Claim 1 (emphasis added). A POSITA would have understood that the total range of the non-magnesium elements disclosed in Claim 1 of Xiao is 15 to 40%, leaving 60-85 wt% for magnesium. Ex. 1002 at ¶ 149. The examples of Xiao disclose a range of magnesium from 54.5 wt% - 79.2 wt%. *Id.* Thus, Xiao discloses a range of magnesium 54.5-85 wt%, which overlaps and covers much of the claimed ranges set forth in these claim elements. Claim 2 discloses: a "magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%." Id. at Claim 2. These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate			None of the references recite this limitation.

	alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (Xiao at ¶ 0023) and particularly described in association with Example 7 of Xiao (Id. at ¶¶ 0057–0060) for which a POSITA would have calculated for Example 7 of Xiao the specific weight percentage (ranges) of each additive material or secondary metal. In particular, a POSITA would have determined that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. Accordingly, these claim elements are disclosed by Xiao.			

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58. The magnesium composite as defined in claim 49, wherein said magnesium alloy includes 60-95 wt % magnesium, 0.5-10 wt % aluminum, 0.05-6 wt % zinc, and 0.15-2 wt % manganese.	Claim 1 of Xiao discloses a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%; the remainder is Mg, and a sum of the weight percentages of the components is 100%." Xiao at Claim 1 (emphasis added). A POSITA would have understood that the total range of the non-magnesium elements disclosed in Claim 1 of Xiao is 15 to 40%, leaving 60-85 wt% for magnesium. Ex. 1002 at ¶ 149. The examples of Xiao disclose a range of magnesium from 54.5 wt% - 79.2 wt%. *Id.* Thus, Xiao discloses a range of magnesium 54.5-85 wt%, which overlaps and covers much of the claimed ranges set forth in these claim elements. Claim 2 discloses: a "magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%." Id. at Claim 2. These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate			None of the references recite this limitation.

	alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (Xiao at ¶ 0023) and particularly described in association with Example 7 of Xiao (Id. at ¶¶ 0057–0060) for which a POSITA would have calculated for Example 7 of Xiao the specific weight percentage (ranges) of each additive material or secondary metal. In particular, a POSITA would have determined that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. Accordingly, these claim elements are disclosed by Xiao.			

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59. The magnesium composite as defined in claim 49, wherein said magnesium alloy includes over 50 wt % magnesium and one or more metals selected from the group consisting of 0.5-10 wt % aluminum, 0.1-2 wt % zinc, 0.01-1 wt % zirconium, and 0.15-2 wt % manganese.	Claim 1 of Xiao discloses a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%; the remainder is Mg, and a sum of the weight percentages of the components is 100%." Xiao at Claim 1 (emphasis added). A POSITA would have understood that the total range of the non-magnesium elements disclosed in Claim 1 of Xiao is 15 to 40%, leaving 60-85 wt% for magnesium. Ex. 1002 at ¶ 149. The examples of Xiao disclose a range of magnesium from 54.5 wt% - 79.2 wt%. *Id.* Thus, Xiao discloses a range of magnesium 54.5-85 wt%, which overlaps and covers much of the claimed ranges set forth in these claim elements. Claim 2 discloses: a "magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%." Id. at Claim 2. These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate			None of the references recite this limitation.

	alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (Xiao at ¶ 0023) and particularly described in association with Example 7 of Xiao (Id. at ¶¶ 0057–0060) for which a POSITA would have calculated for Example 7 of Xiao the specific weight percentage (ranges) of each additive material or secondary metal. In particular, a POSITA would have determined that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. Accordingly, these claim elements are disclosed by Xiao.			

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60. The magnesium composite as defined in claim 49, wherein said magnesium alloy includes over 50 wt % magnesium, and one or more metals selected from the group consisting of 0.1-3 wt % zinc, 0.01-1 wt % zirconium, 0.05-1 wt % manganese, 0.0002-0.04 wt % boron, and 0.4-0.7 wt % bismuth.	Claim 1 of Xiao discloses a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%; the remainder is Mg, and a sum of the weight percentages of the components is 100%." Xiao at Claim 1 (emphasis added). A POSITA would have understood that the total range of the non-magnesium elements disclosed in Claim 1 of Xiao is 15 to 40%, leaving 60-85 wt% for magnesium. Ex. 1002 at ¶ 149. The examples of Xiao disclose a range of magnesium from 54.5 wt% - 79.2 wt%. *Id.* Thus, Xiao discloses a range of magnesium 54.5-85 wt%, which overlaps and covers much of the claimed ranges set forth in these claim elements. Claim 2 discloses: a "magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%." Id. at Claim 2. These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate			None of the references recite this limitation.

	alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (Xiao at ¶ 0023) and particularly described in association with Example 7 of Xiao (Id. at ¶¶ 0057–0060) for which a POSITA would have calculated for Example 7 of Xiao the specific weight percentage (ranges) of each additive material or secondary metal. In particular, a POSITA would have determined that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. Accordingly, these claim elements are disclosed by Xiao.			

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61. The magnesium composite as defined in claim 49, wherein said additive material includes nickel,	Xiao discloses a "magnesium alloy…and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy…" Xiao at ¶ 0026, ll. 1–9. Xiao teaches the use of a variety of metals as additive materials. See, e.g., Xiao at ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . .”Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including nickel, among other metals. Thus, Xiao discloses a number of metal additives, including nickel, and hence fully discloses all of the limitations of these claim elements.			None of the references recite this limitation.

’653 Patent Claims	Anticipated by CN 103343271 A Xiao et al.	At Least Made Obvious By CN 103343271 A Xiao et al.	Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...	Terves’ Response
said nickel constitutes about 0.05-35 wt % of said magnesium composite,	Claim 1 of Xiao discloses: a “magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%, the remainder is Mg, and a sum of the weight percentages of the components is 100%.” Xiao at Claim 1. And Claim 2 discloses: a “magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%.” Id. at Claim 2. These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (Xiao at ¶ 0023) and particularly described in association with Example 7 of Xiao (Id. at ¶¶ 0057–0060) for which a POSITA would have calculated for Example 7 of Xiao the specific weight percentage (ranges) of each additive material or secondary metal. In particular, a POSITA would have determined that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt%			None of the references recite this limitation.

	copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. Accordingly, these claim elements are disclosed by Xiao.			
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
said nickel forms galvanically-active in situ precipitate in said magnesium composite.	Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao at ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β ($Mg_{17}Al_{12}$) phase and eutectic phase on the grain boundary of the			None of the references recite this limitation.

	magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." Id. These elements are among the claimed "secondary metals" disclosed by Xiao. Thus, all of the limitations of this claim element are disclosed by Xiao.			
’653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
64. The magnesium composite as defined in claim 49, wherein said additive material includes copper,	Xiao discloses a "magnesium alloy…and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy…" Xiao at ¶ 0026, ll. 1–9. Xiao teaches the use of a variety of metals as additive materials. See, e.g., Xiao at ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ." Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-			None of the references recite this limitation.

	Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including, in particular, copper, among other metals. Thus, Xiao discloses a number of metal additives, including copper, and hence fully discloses all of the limitations of this claim element.			
’653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
said copper constitutes about 0.05-35 wt % of said magnesium composite,	Claim 1 of Xiao discloses: a “magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%, the remainder is Mg, and a sum of the weight percentages of the components is 100%.” Xiao at Claim 1. And Claim 2 discloses: a “magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%.” Id. at Claim 2. These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (Xiao at ¶ 0023) and particularly described in association with			None of the references recite this limitation.

	Example 7 of Xiao (Id. at ¶¶ 0057–0060) for which a POSITA would have calculated for Example 7 of Xiao the specific weight percentage (ranges) of each additive material or secondary metal. In particular, a POSITA would have determined that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. Accordingly, these claim elements are disclosed by Xiao.			

'653 Patent Claims	Anticipated by CN 103343271 A Xiao et al.	At Least Made Obvious By CN 103343271 A Xiao et al.	Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...	Terves' Response
said copper forms the galvanically-active in situ precipitate in said magnesium composite.	Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao at ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β ($Mg_{17}Al_{12}$) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." Id. These elements are among the claimed "secondary metals" disclosed by Xiao. Thus, all of the limitations of this claim element are disclosed by Xiao.			None of the references recite this limitation.
66. The magnesium composite as defined in claim 49, wherein a	A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates ("decomposition rates") because the units of measurement are the units			None of the references recite this limitation.

dissolution rate of said magnesium composite is about 5-325 mg/cm2/hr. in 3 wt % KCI water mixture at 90°C.	used by POSITAs to measure dissolution rates. The disclosed table provides seven examples (excluding the comparative [prior art] example). Xiao at ¶ 0064. Xiao provides dissolution rates in g/cm2/hr, while the claims of the '653 Patent express dissolution rates in mg/cm2/hr. A POSITA would have known converting between g/cm2/hr to mg/cm2/hr, merely requires multiplication by 1,000. Thus, as each of Xiao's seven examples (excluding the comparative [prior art] example) has a dissolution rate within the claimed range of "about 5-325 mg/cm2/hr in 3 wt.% KCl water" at both 70°C or 93°C (with Example 7 being more than seven times that floor), a POSITA in April 2014 would have recognized that the dissolution rate of the examples in Xiao would necessarily have been well above the claimed floor of "about 5" mg/cm2/hr at the claimed 90°C.			
<u>'653 Patent Claims</u>	**<u>Anticipated by CN 103343271 A Xiao et al.</u>**	**<u>At Least Made Obvious By CN 103343271 A Xiao et al.</u>**	**<u>Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...</u>**	**<u>Terves' Response</u>**
67. The magnesium composite as defined in claim 49, wherein a dissolution rate of	A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates ("decomposition rates") because the units of measurement are the units used by POSITAs to measure			None of the references recite this limitation.

said magnesium composite is at least 45 mg/cm2/hr. in 3 wt % KCl water mixture at 90°C. and up to 325 mg/cm2/hr. in 3 wt % KCl water mixture at 90°C.	dissolution rates. The disclosed table provides seven examples (excluding the comparative [prior art] example). Xiao at ¶ 0064. Xiao provides dissolution rates in g/cm2/hr, while the claims of the '653 Patent express dissolution rates in mg/cm2/hr. A POSITA would have known converting between g/cm2/hr to mg/cm2/hr, merely requires multiplication by 1,000. Six of the seven examples (excluding the comparative [prior art] example) provided in Xiao therefore discloses a dissolution rate of "at least 45 mg/cm2/hr in 3 wt % KCl water" and "up to 325 mg/cm2/hr in 3 wt % KCl water" at 93°C. Given that the dissolution rates of Xiao slightly above (i.e., 3°C above) 90°C are almost all above the claimed floor of "at least 45 mg/cm2/hr". As such, a POSITA in April 2014 would have expected the dissolution rate of the examples in Xiao at 90°C to also be necessarily above the claimed floor of "at least 45 mg/cm2/hr." Thus, this element is disclosed by Xiao.			
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
69. The magnesium composite as defined in claim	Xiao discloses a "magnesium alloy…and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance			None of the references recite this limitation.

49, wherein said additive material has a melting point temperature that is 100°C. greater than a melting temperature of said magnesium or magnesium alloy.	of the magnesium alloy...” Xiao at ¶ 0026, ll. 1–9. A POSITA in April 2014 would have understood “melting temperature” in this claim element to be a reference to the smelting temperature or temperature of the melt when the additive material is being added to the magnesium or magnesium alloy, not the “melting point temperature” as that measurement is used for the additive material. Xiao generally discloses “loading pure magnesium and pure aluminum into a smelting furnace and increasing the temperature to 700 to 730 °C, next loading pure zinc and an [sic] intermediate alloys . . . into a resulting magnesium-aluminum alloy melt after melting and increasing the temperature to 740 to 780°C . . . .” Xiao at ¶¶ 0021–0022; see also Id. at Claim 5 (“the melting temperature of the pure magnesium and pure aluminum is from 700 to 730 °C.”) Examples 1–7 of Xiao teach a range of smelting temperatures for the magnesium-aluminum alloy from 700°C (Example 1) to 730°C (Examples 2, 5, and 7). Xiao ¶¶ 0034–0060. The additive materials noted above are one or more of the intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ag, Al-Zr, Al-Ti. Id. at ¶ 0023. A POSITA using typical phase diagrams for each of these additive materials			

	would be able to readily determine the melting point temperature. A POSITA in April 2014 would have recognized that Al-Fe had a variable melting point temperature ranging from 1538°C (pure iron) down to 652°C for a eutectic point near 99 wt% aluminum; Al-Ni had a variable melting point temperature that ranges from 1640°C down to 640°C (depending upon the alloy mixture); and Al-Cu had a variable melting point temperature ranging from 548°C up to 1084°C (depending upon the alloy mixture). Example 7 of Xiao specifically discloses a melting or smelting temperature of 730°C. Xiao at ¶ 0060. A POSITA could specifically analyze Example 7 of Xiao to determine (using particular intermediate alloy compositions) the melting point temperatures of the intermediate alloys added. Thus, in April 2014, a POSITA would have recognized from Example 7 of Xiao that at least an aluminum-nickel additive having 45 wt% nickel has a melting point temperature of 854°C which is 100°C greater than the melting or smelting temperatures of the magnesium aluminum alloy used in Example 7 (i.e., 730°C) and otherwise taught generally by Xiao (i.e., 700-730°C). A POSITA in April 2014 would have also recognized that other intermediate alloy compositions could have fallen			

	within the teachings of Example 7 and other disclosures of Xiao and resulted in Al-Fe, Al-Ni, and Al-Cu intermediate alloys that would have had melting point temperatures that were 100°C. greater than the smelting temperatures of the magnesium alloy generally taught by Xiao (i.e., 700-730°C). Thus, this claim element was disclosed by Xiao.			
’653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
70. The magnesium composite as defined in claim 49, wherein said magnesium composite is at least partially included in a down hole well component,	Xiao discloses a “magnesium alloy…and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy…” Xiao at ¶ 0026, ll. 1–9. Xiao discloses that the cast magnesium alloy “can be used as a tripping ball material for a multi-stage sliding sleeve staged-fracturing technique.” Xiao at ¶ 0001. A POSITA would have understood that a tripping ball was a type of tool component in an oil well drilling operation. Thus, these claim elements were disclosed by Xiao.			None of the references recite this limitation.
said down hole well component including one or more components	Xiao discloses that the cast magnesium alloy “can be used as a tripping ball material for a multi-stage sliding sleeve staged-fracturing			None of the references recite this limitation.

selected from the group consisting of a sleeve, frac ball, hydraulic actuating tooling, tube, valve, valve component, or plug.	technique." Xiao at ¶ 0001. A POSITA would have understood that a tripping ball was a type of tool component in an oil well drilling operation.			
’653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
73. A dissolvable magnesium composite for use in a ball or other tool component in a well drilling or completion operation,	Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." Xiao at ¶ 0026, ll. 1–9. Xiao discloses that the cast magnesium alloy "can be used as a tripping ball material for a multi-stage sliding sleeve staged-fracturing technique." ¶ 0001. A POSITA would have understood that a tripping ball was a type of tool component in an oil well drilling operation. Thus, these claim elements were disclosed by Xiao.			The preamble does not identify any limitations so that none of the references cited by defendants are relevant. Alternatively, none of the cited references disclose A magnesium composite that includes in situ precipitation of galvanically- active intermetallic phases to enable controlled dissolution of said magnesium composite.
said dissolvable magnesium composite includes	Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe,			None of the references recite this limitation.

in situ precipitation of galvanically-active intermetallic phases to enable controlled dissolution of said magnesium composite,	Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β ($Mg_{17}Al_{12}$) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." Xiao at ¶ 0026. A POSITA in August 2014 would have understood this disclosure of "intermetallic composite micro-particles" to be a reference to intermetallic precipitate. A POSITA reading the Xiao reference in April 2014 would have recognized that the precipitation of galvanically-active intermetallic phases ("micro-batteries") are naturally and necessarily generated by the in situ reaction between magnesium and any and all of the disclosed metal additives forming in situ precipitate.			

'653 Patent Claims	Anticipated by CN 103343271 A Xiao et al.	At Least Made Obvious By CN 103343271 A Xiao et al.	Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...	Terves' Response
said magnesium composite comprising a mixture of magnesium or a magnesium alloy and an additive material,	Xiao discloses "first loading pure magnesium and pure aluminum into a smelting furnace . . . next loading pure zinc and an [sic] intermediate alloys of trace element components into a resulting magnesium-aluminum alloy melt after melting." Xiao, at ¶ 0022. Xiao discloses that "Al-Fe ... Al-Ni ... Al-Cu ... Al- Ag ... Al-Zr ... and ... Al-Ti intermediate alloy[s], are heated to dry and then added to the magnesium-aluminum alloy melt." Id. at ¶ 0023. The addition of these intermediate alloys to the melted magnesium alloy necessarily results in a mixture of the additive material and magnesium alloy.			None of the references recite this limitation.
said additive material constituting about 0.05 wt % of said mixture,	Claim 1 of Xiao discloses: a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%, the remainder is Mg, and a sum of the weight percentages of the components is 100%." Xiao at Claim 1. And Claim 2 discloses: a "magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the			None of the references recite this limitation.

	weight percentages of the components is 100%." Id. at Claim 2. These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (Xiao at ¶ 0023) and particularly described in association with Example 7 of Xiao (Id. at ¶¶ 0057–0060) for which a POSITA would calculate for Example 7 of Xiao the specific weight percentage (ranges) of each additive material or secondary metal. In particular, a POSITA would have determined that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. Thus, a POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. Accordingly,			

	these claim elements are disclosed by Xiao.			
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
said additive material is a metal or metal alloy,	Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." Xiao at ¶ 0026, ll. 1–9. Xiao teaches the use of a variety of metals as additive materials. See, e.g., Xiao at ¶ 0026. For instance, Xiao claims that the magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ." Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these additive materials contain metal(s). Accordingly, Example 7 of Xiao discloses this claim element in accordance with Patent Owner's definition of "additive material."			None of the references recite this limitation.
said additive material includes one or more metals selected	Xiao teaches the use of a variety of metals as additive materials. See, e.g., Xiao at ¶ 0026. For instance, Xiao claims that the novel			None of the references recite this limitation.

from the group consisting of copper, nickel, titanium, iron, silicon, and cobalt,	magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ."Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including, in particular, copper, nickel, and iron, among other metals. Thus, Xiao discloses a number of metal additives, including copper, nickel, and iron and, hence fully discloses all of the limitations of these claim elements.			
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
said magnesium composite including in situ precipitation of galvanically-active intermetallic phases that include said additive material,	Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao at ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β ($Mg_{17}Al_{12}$) phase and eutectic phase on the grain boundary of the			None of the references recite this limitation.

	magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro- batteries] greatly accelerate the corrosion decomposition of magnesium alloy." Id. A POSITA in August 2014 would have understood this disclosure of "intermetallic composite micro-particles" to be a reference to intermetallic precipitate. As noted above, at least Fe, Cu, and Ni are "additive materials." Consequently, the in-situ precipitation of galvanically- active intermetallic phases will include one or more of these additive materials. Thus, Xiao discloses all of these claim limitations.			
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
said additive material located in sufficient quantities in said galvanically-active intermetallic phases so as to obtain a composition and morphology of said galvanically-active	A POSITA would understand that the galvanically-active intermetallic phases ("composite micro-particles") have a morphology that enhances the corrosion dissolution rate of the alloy due to a larger number of smaller particles throughout the microstructure. A POSITA would also understand the relationship between "composite micro-particles"			None of the references recite this limitation.

intermetallic phases such that a galvanic corrosion rate along said galvanically-active intermetallic phases causes said magnesium composite to have a dissolution rate of at least at least 5 mg/cm2/hr. in 3 wt % KCl water mixture at 90°C.	and morphology of the galvanically-active intermetallic phases. Id. With respect to the "sufficient quantities" limitation, other claim limitations in Claims 49 and 73 define the weight percentage for the additive material as 0.05-45 wt% and about 0.05 wt%, respectively, which limitations are met by the teaching of Xiao with respect to four metals. In particular, Xiao discloses that "[e]lements such as Fe, Cu, Ni, Ag, etc., in the magnesium alloy can form a large number of intermetallic composite micro-particles, which can improve the corrosion performance of the magnesium alloy, thereby promoting the decomposition of the magnesium alloy." Id. ¶ 0026. And the magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%;..." Id. at Claim 2. As such, Xiao discloses four metals (i.e., Fe, Cu, Ni, and Ti) included within the list of "additive material" set forth in Claim Element M, supra. The claimed weight % quantities of the "additive material" of Claim Element I, supra, also overlap with the weight % ranges of Xiao's "trace elements". As such, Claim Element P of claims 49 and 73-- that the "additive materials" are located in "sufficient quantities"--is fully disclosed by Xiao's Claim 2			

	disclosure of "trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%..." Id. As such, Xiao's four metal "trace elements" are present in "sufficient quantities" to meet Claim Element P of claims 49 and 73. A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates ("decomposition rates") because the units of measurement are the units used by POSITAs to measure dissolution rates. The disclosed table provides seven examples (excluding the comparative [prior art] example). Xiao at ¶ 0064. Xiao provides dissolution rates in g/cm2/hr, while the claims of the '653 Patent express dissolution rates in mg/cm2/hr. A POSITA would have known converting between g/cm2/hr to mg/cm2/hr, merely requires multiplication by 1,000. Thus, as each of Xiao's seven examples (excluding the comparative [prior art] example) has a dissolution rate of at least three times the claimed "at least 5 mg/cm2/hr in 3 wt.% KCl water" at both 70°C or 93°C (with Example 7 being more than seven times that floor), a POSITA in April 2014 would have recognized that the dissolution rate of the examples in Xiao would necessarily have been well above the claimed			

	floor of "at least of 5 mg/cm2/hr" at the claimed 90°C.			
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
74. A dissolvable magnesium composite for use in a ball or other tool component in a well drilling or completion operation,		Xiao discloses a "magnesium alloy…and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy…" Xiao at ¶ 0026, ll. 1–9. Xiao discloses that the cast magnesium alloy "can be used as a tripping ball material for a multi-stage sliding sleeve staged-fracturing technique." Xiao at ¶ 0001. A POSITA would have understood that a tripping ball was a type of tool component in an oil well drilling operation. Thus, these claim elements were disclosed by Xiao.		The preamble does not identify any limitations so that none of the references cited by defendants are relevant. Alternatively, none of the cited references disclose A magnesium composite that includes in situ precipitation of galvanically- active intermetallic phases to enable controlled dissolution of said magnesium composite.
said dissolvable magnesium composite includes in situ precipitation of galvanically-active intermetallic phases to enable		Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the		None of the references recite this limitation.

controlled dissolution of said magnesium composite,		magnesium alloy. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β ($Mg_{17}Al_{12}$) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." Xiao at ¶ 0026. A POSITA in August 2014 would have understood this disclosure of "intermetallic composite micro-particles" to be a reference to intermetallic precipitate. A POSITA reading the Xiao reference in April 2014 would have recognized that the precipitation of galvanically-active intermetallic phases ("micro-batteries") are		

		naturally and necessarily generated by the in situ reaction between magnesium and any and all of the disclosed metal additives forming in situ precipitate. Thus, these claim elements were disclosed by Xiao.		
’653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag…**	**Terves’ Response**
said magnesium composite comprising a mixture of magnesium or a magnesium alloy and an additive material,		Xiao discloses “first loading pure magnesium and pure aluminum into a smelting furnace . . . next loading pure zinc and an [sic] intermediate alloys of trace element components into a resulting magnesium-aluminum alloy melt after melting.” Xiao, at ¶ 0022. Xiao discloses that “Al-Fe ... Al-Ni ... Al-Cu ... Al- Ag ... Al-Zr ... and ... Al-Ti intermediate alloy[s], are heated to dry and then added to the magnesium-aluminum alloy melt.” Id. at ¶ 0023. The addition of these intermediate alloys to the melted magnesium alloy necessarily results in a mixture of the additive material and magnesium alloy.		None of the references recite this limitation.

'653 Patent Claims	Anticipated by CN 103343271 A Xiao et al.	At Least Made Obvious By CN 103343271 A Xiao et al.	Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...	Terves' Response
said additive material constituting at least 0.1 wt % of said mixture,		Claim 1 of Xiao discloses: a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%, the remainder is Mg, and a sum of the weight percentages of the components is 100%." Xiao at Claim 1. And Claim 2 discloses: a "magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%." Id. at Claim 2. These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (Xiao at ¶ 0023) and particularly described in association with Example 7 of Xiao (Id. at ¶¶ 0057–0060) for which		None of the references recite this limitation.

		a POSITA would have calculated for Example 7 of Xiao the specific weight percentage (ranges) of each additive material or secondary metal. In particular, a POSITA would have determined that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. Thus, a POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. Accordingly, these		

		claim elements are disclosed by Xiao		
’653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag…**	**Terves’ Response**
said magnesium in said magnesium composite constituting at least 85 wt %,		Claim 1 of Xiao discloses a “magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%, the remainder is Mg, and a sum of the weight percentages of the components is 100%.” Xiao (emphasis added). A POSITA would have understood that the range of non-magnesium elements in Claim 1 leaves 60-85 wt% for magnesium. Thus, Xiao discloses a range of magnesium up to 85 wt%, which touches the claimed range (i.e. at least 85wt% magnesium) set forth in this claim element. However, this leaves no room for any of the claimed additive materials. Xiao also discloses a prior art magnesium alloy represented by Mg-Al-Zn (with AZ91D magnesium alloy being the most widely used) wherein the “main components of this alloy		None of the references recite this limitation.

		and the respective weight percentages are as follows: Al 8.3 to 9.7, Zn 0.35 to 1.0, Mn 0.15 to 0.5, and the remainder [(i.e. 88.8 to 91.2 wt%)] is magnesium." Id. at ¶ 0003. Xiao also uses an AZ91D as a comparative example alloy, with a composition of 9 wt% Al, 1 wt% Zn, 0.3 wt% Zr, and 0.1 wt% Mn, with the remainder (i.e. 89.6 wt%) being magnesium. Id. at ¶ 0032. Xiao teaches a primary difference between this prior art and its novel magnesium alloy lies in the addition of metallic elements like Iron, Copper, and/or Nickel into the alloy. Id. at ¶ 0026 ("[e]lements such as Fe, Cu, Ni, Ag, etc., in the magnesium alloy can form a large number of intermetallic composite micro-particles, which can improve the corrosion performance of the magnesium alloy, thereby promoting the decomposition of the magnesium alloy"). The dissolution data in Xiao (Xiao at ¶ 0061) teaches that the addition of Iron, Copper, and/or Nickel		

		(alongside the Aluminum, Zinc, Zirconium, and Manganese of the prior art AZ91D example) caused a surprisingly large increase in dissolution rates. Thus, Xiao, as a whole, teaches magnesium compositions with magnesium content above 85wt% and "room" for the novel additive materials (i.e. "Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%" (Xiao at Claim 2)). Thus, Xiao fully discloses a range of magnesium of at least 85 wt %, touching and even overlapping the claim range.		
'653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
said additive material is a metal material selected from the group consisting of copper, nickel and cobalt,		Xiao teaches the use of a variety of metals as additive materials. See, e.g., Xiao at ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ."Id.		None of the references recite this limitation.

		at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including, in particular, copper, nickel, and iron, among other metals. Thus, Xiao discloses a number of metal additives, including copper, nickel, and iron and, hence fully discloses all of the limitations of these claim elements.		
’653 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
said magnesium composite including in situ precipitation of galvanically-active intermetallic phases that include said additive material,		Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao at ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy		None of the references recite this limitation.

		in terms of a cathode phase, which Xiao explains includes "the β ($Mg_{17}Al_{12}$) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." Id. A POSITA in August 2014 would have understood this disclosure of "intermetallic composite micro-particles" to be a reference to intermetallic precipitate. As noted above, at least Fe, Cu, and Ni are "additive materials." Consequently, the in-situ precipitation of galvanically- active intermetallic phases will include one or more of these additive materials.		

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said magnesium composite has a dissolution rate of 84-325 mg/cm2/hr. in 3 wt % KCl water mixture at 90°C.		As for the final limitation of Claim 74, it requires a dissolution rate of 84–325 mg/cm2/hr. in 3 wt % KCl water mixture at 90°C, the novel examples explicitly analyzed in Xiao disclose dissolution rates only up to 74 mg/cm2/hr in 3 wt.% KCl water at 93°C, shy of this claimed range. However, a POSITA in April 2014 would have understood Xiao to also teach dissolution rates above the floor of 84 mg/cm2/hr at 90°C claimed in Claim 74, because (1) the dissolution rates in the Xiao examples are very close to the claimed floor (e.g. Example 1 exhibited a rate of 74 mg/cm2/hr at 93°C, Example 6 a rate of 63 mg/cm2/hr at 90°C, and Example 7 a rate of 57 mg/cm2/hr at 93°C; and (2) a POSITA would have expected that other magnesium compositions having additive amounts in the ranges as disclosed by Xiao, but with higher		None of the references recite this limitation.

		amounts of copper, nickel, and/or iron than the amounts tested by Xiao's examples would have improved corrosion performance. In particular, even though they come close to the 84 mg/cm2/hr at 90°C, Examples 1, 6 and 7 of Xiao had less aggregate copper, nickel and iron than taught by Claim 2 of Xiao (i.e. 5 wt% for each of copper, nickel, and iron in a magnesium composite). Thus, the Examples in Xiao used lower amounts of these specific dissolution-enhancing additive elements. As such, a POSITA in April 2014 would have understood this and recognized that Xiao teaches magnesium compositions having dissolution rates above the claimed floor of "at least 84 mg/cm2/hr." Id. It was well-known prior to April 2014 that additions of copper, iron, nickel and cobalt cause a sharp linear increase in the corrosion rate of magnesium as evidenced by Shaw, "Corrosion Resistance of Magnesium Alloys" published in 2003 in the		

		ASM Handbook, Vol. 13A (2003). As such, the recitation of the claimed dissolution rate of 84-325 mg/cm2/hr at 90°C was not a new property or use but rather a property that would be inherent in the compositions disclosed in Xiao, as confirmed by the extrinsic evidence of Shaw.		

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2. A dissolvable magnesium composite that at least partially forms a ball, a frac ball, a tube, a plug or other tool component that is to be used in a well drilling or completion operation,	Xiao discloses a "magnesium alloy…and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy…" Xiao ¶ 0026. Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β ($Mg_{17}Al_{12}$) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." Xiao ¶ 0026. Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe,	A POSITA in August 2014 would have understood this disclosure as "magnesium composite that at least partially forms a ball, a frac ball, a tube, a plug or other tool component that is to be used in a well drilling or completion operation, …." Thus, this claim element was rendered obvious by Xiao.		The preamble does not identify any limitations so that none of the references cited by defendants are relevant. Alternatively, none of the cited references disclose a magnesium composite that includes in situ precipitation of galvanically- active intermetallic phases to enable controlled dissolution of said magnesium composite.

	Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β ($Mg_{17}Al_{12}$) phase and eutectic phase on the grain boundaryof the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." Xiao ¶ 0026. Thus, this claim element was anticipated by Xiao.			
'740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
said dissolvable dissolvable [sic] magnesium composite includes in situ precipitate,	Xiao discloses a "dissolvable dissolvable [sic] magnesium composite includes in situ precipitate ...." Thus, this claim element was anticipated by Xiao.	A POSITA in August 2014 would have understood this disclosure as "dissolvable dissolvable [sic] magnesium composite includes in situ precipitate ...." Thus, this claim element was rendered obvious by Xiao.		None of the references recite this limitation.

said dissolvable magnesium composite comprising a mixture of magnesium or a magnesium alloy and an additive material,	Xiao discloses a "magnesium composite comprising a mixture of magnesium or a magnesium alloy and an additive material ...." Thus, this claim element was anticipated by Xiao.	A POSITA in August 2014 would have understood this disclosure as "magnesium composite comprising a mixture of magnesium or a magnesium alloy and an additive material, ..." Thus, this claim element was rendered obvious by Xiao.		None of the references recite this limitation.
'740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
said magnesium composite includes greater than 50 wt. % magnesium, said in situ precipitate includes	Xiao discloses a "magnesium composite includes greater than 50 wt. % magnesium, said in situ precipitate ...." Thus, this claim element was anticipated by Xiao.	A POSITA in August 2014 would have understood this disclosure as "magnesium composite includes greater than 50 wt. % magnesium, said in situ precipitate ...." Thus, this claim element was rendered obvious by Xiao.		None of the references recite this limitation.
said additive material, said additive material [sic] includes one or more metal materials selected from the group consisting of a) copper wherein said copper constitutes 0.1-35 wt. % of said dissolvable magnesium	Xiao discloses a "additive material, said additive material [sic] includes one or more metal materials selected from the group consisting of a) copper wherein said copper constitutes 0.1-35 wt. % of said dissolvable magnesium composite, b) wt. % nickel wherein said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium composite, and c) cobalt wherein said cobalt constitutes 0.1-20 wt. % of said dissolvable magnesium composite...."	Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this		None of the references recite this limitation.

composite, b) wt. % nickel wherein said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium composite, and c) cobalt wherein said cobalt constitutes 0.1-20 wt. % of said dissolvable magnesium composite,	Thus, this claim element was anticipated by Xiao.	disclosure to mean "over 50 wt. % magnesium and one or more metals selected from the group consisting of aluminum, boron, bismuth, zinc, zirconium, and manganese." It would have been obvious to a PHOSITA to include both Mg and Mn as both are subject to similar corrosion behavior. Based on the combination of "aluminum, boron, bismuth, zinc, zirconium, and manganese" it would have been obvious to a PHOSITA to include Co in the amounts referenced.		
’740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
said dissolvable magnesium composite has a dissolution rate of at least 75 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. A POSITA in August 2014 would have understood this disclosure to mean "a dissolution rate of at least	Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. A POSITA in August 2014 would have understood this		None of the references recite this limitation.

	75 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." Thus, this claim element was anticipated by Xiao.	disclosure as a "magnesium composite has a dissolution rate of at least 75 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." Thus, this claim element was rendered obvious by Xiao.		
'740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
3. The dissolvable magnesium composite as defined in claim 2, wherein said dissolvable magnesium composite has a dissolution rate of 75-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. A POSITA in August 2014 would have understood this disclosure to mean "a dissolution rate of 75-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." Thus, this claim element was anticipated by Xiao.	Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. A POSITA in August 2014 would have understood this disclosure as a "magnesium composite has a dissolution rate of at least 75 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." Thus, this claim element was rendered obvious by Xiao.		None of the references recite this limitation.

4. The dissolvable magnesium composite as defined in claim 2, wherein said dissolvable magnesium composite has a dissolution rate of 84-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. A POSITA in August 2014 would have understood this disclosure to mean "a dissolution rate of 84-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." Thus, this claim element was anticipated by Xiao.	Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. A POSITA in August 2014 would have understood this disclosure as a "magnesium composite has a dissolution rate of 84-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." Thus, this claim element was rendered obvious by Xiao.		None of the references recite this limitation.
'740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
5. The dissolvable magnesium composite as defined in claim 2, wherein said dissolvable magnesium composite has a dissolution rate of	Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-	Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing		None of the references recite this limitation.

100-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	Al-Zn type AZ91D magnesium alloy).” Xiao ¶ 0028. A POSITA in August 2014 would have understood this disclosure to mean “a dissolution rate of 100-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.” Thus, this claim element was anticipated by Xiao.	ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy).” Xiao ¶ 0028. A POSITA in August 2014 would have understood this disclosure to mean “a dissolution rate of 100-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.” Thus, this claim element was disclosed by Xiao.		
<u>’740 Patent Claims</u>	**<u>Anticipated by CN 103343271 A Xiao et al.</u>**	**<u>At Least Made Obvious By CN 103343271 A Xiao et al.</u>**	**<u>Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...</u>**	**<u>Terves’ Response</u>**
6. The dissolvable magnesium composite as defined in claim 2, wherein said dissolvable magnesium composite has a dissolution rate of 0.6-1 mg/cm2/hr. in 3 wt. % KCl water mixture at 21° C.	Xiao discloses a “light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg.” Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean “a dissolution rate of 0.6-1 mg/cm2/hr. in 3 wt. % KCl water mixture at 21° C.” Further, Xiao discloses a “decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium	Xiao discloses a “decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy).” Xiao ¶ 0028. A POSITA in August 2014 would have understood this disclosure to mean “a dissolution rate of 100-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.”		None of the references recite this limitation.

	chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. Thus, this claim element was anticipated by Xiao.	Thus, this claim element was disclosed by Xiao.		
'740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
7. The dissolvable magnesium composite as defined in claim 2, wherein said dissolvable magnesium composite has a dissolution rate of 0.5-1 mg/cm2/hr. in 3 wt. % KCl water mixture at 20° C.	Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "a dissolution rate of 0.5-1 mg/cm2/hr. in 3 wt. % KCl water mixture at 20° C" Further, Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such	Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. A POSITA in August 2014 would have understood this disclosure to mean "a dissolution rate of 0.5-1 mg/cm2/hr. in 3 wt. % KCl water mixture at 20° C." Thus, this claim element was disclosed by Xiao.		None of the references recite this limitation.

	as the Mg-Al-Zn type AZ91D magnesium alloy).” Xiao ¶ 0028. Thus, this claim element was anticipated by Xiao.			
’740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag…**	**Terves’ Response**
8. The dissolvable magnesium composite as defined in claim 2, wherein said magnesium alloy comprises greater than 50 wt. % magnesium and no more than 10 wt. % aluminum, and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.1-2 wt. % zinc, 0.01-1 wt. % zirconium, and 0.15-2 wt. % manganese.	Xiao discloses a “light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg.” Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean a “magnesium alloy comprises greater than 50 wt. % magnesium and no more than 10 wt. % aluminum, and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.1-2 wt. % zinc, 0.01-1 wt. % zirconium, and 0.15-2 wt. % manganese.” Thus, this claim element was anticipated by Xiao.			None of the references recite this limitation.

9. The dissolvable magnesium composite as defined in claim 2, wherein said magnesium alloy comprises greater than 50 wt. % magnesium and no more than 10 wt. % aluminum, and one or more metals selected from the group consisting of 0.1-3 wt. % zinc, 0.05-1 wt. % zirconium, 0.05-0.25 wt. % manganese, 0.0002-0.04 wt. % boron, and 0.4-0.7 wt. % bismuth.	Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean a "magnesium alloy comprises greater than 50 wt. % magnesium and no more than 10 wt. % magnesium alloy comprises greater than 50 wt. % magnesium and no more than 10 wt. % aluminum, and one or more metals selected from the group consisting of 0.1-3 wt. % zinc, 0.05-1 wt. % zirconium, 0.05-0.25 wt. % manganese, 0.0002-0.04 wt. % boron, and 0.4-0.7 wt. % bismuth." Thus, this claim element was anticipated by Xiao.	Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "over 50 wt. % magnesium and one or more metals selected from the group consisting of aluminum, boron, bismuth, zinc, zirconium, and manganese." It would have been obvious to a PHOSITA to include both Mg and Mn as both are subject to similar corrosion behavior. Based on the combination of "aluminum, boron, bismuth, zinc, zirconium, and manganese" it would have been obvious to a PHOSITA to include B and Bi in the amounts referenced. Thus, this claim element was rendered obvious by Xiao.		None of the references recite this limitation.
'740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al.**	**Terves' Response**

			in view of Hassan, Development of High Strength Mag...	
10. The dissolvable magnesium composite as defined in claim 2, wherein said additive material includes nickel.	Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. Xiao discloses a "magnesium composite as defined in claim 2, wherein said additive material includes nickel." Thus, this claim element was anticipated by Xiao.			None of the references recite this limitation.
’740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
11. The dissolvable magnesium composite as defined in claim 2, wherein said additive material includes nickel, said nickel constitutes 0.3-7 wt. % of said dissolvable	Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. Xiao discloses a "material includes nickel, said nickel constitutes 0.3-7			None of the references recite this limitation.

magnesium composite.	wt. % of said dissolvable magnesium composite." Thus, this claim element was anticipated by Xiao.			
13. The dissolvable magnesium composite as defined in claim 2, wherein said additive material includes copper.	Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. Xiao discloses an "additive material [that] includes copper." Thus, this claim element was anticipated by Xiao			None of the references recite this limitation.
'740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
14. The dissolvable magnesium composite as defined in claim 2, wherein said additive material includes copper, said copper constitutes 0.5-15 wt. % of said dissolvable	Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. Xiao discloses an "additive material [that] includes copper."	Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract.		None of the references recite this limitation.

magnesium composite.	Thus, this claim element was anticipated by Xiao.	A POSITA in August 2014 would have understood this disclosure to mean a "said copper constitutes 0.5-15 wt. % of said dissolvable magnesium composite" Thus, this claim element was made obvious by Xiao.		
16. The dissolvable magnesium composite as defined in claim 2, wherein said magnesium content in said dissolvable magnesium composite is at least 75 wt. %.	Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. Xiao discloses an "magnesium content in said dissolvable magnesium composite is at least 75 wt. %." Thus, this claim element was anticipated by Xiao..			None of the references recite this limitation.
’740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
17. The dissolvable magnesium composite as defined in claim 2, wherein said	Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe,			None of the references recite this limitation.

magnesium content in said dissolvable magnesium composite is at least 85 wt. %.	0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. Xiao discloses an "magnesium content in said dissolvable magnesium composite is at least 85 wt. %.." Thus, this claim element was anticipated by Xiao.			
<u>'740 Patent Claims</u>	**<u>Anticipated by CN 103343271 A Xiao et al.</u>**	**<u>At Least Made Obvious By CN 103343271 A Xiao et al.</u>**	**<u>Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...</u>**	**<u>Terves' Response</u>**
19. A dissolvable magnesium cast composite comprising				The preamble does not identify any limitations so that none of the references cited by defendants are relevant. Alternatively, none of the cited references disclose a magnesium composite that includes in situ precipitation of galvanically- active intermetallic phases to enable controlled dissolution of said magnesium composite.

a mixture of magnesium or a magnesium alloy and an additive material, said additive material includes one or more metals selected from the group consisting of a) copper wherein said copper constitutes at least 0.01 wt. % of said dissolvable magnesium cast composite, b) nickel wherein said nickel constitutes at least 0.01 wt. % of said dissolvable magnesium cast composite, and c) cobalt wherein said cobalt constitutes at least 0.01 wt. % of said dissolvable magnesium cast composite,	Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." ¶ 0026, ll. 1-3. Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β ($Mg_{17}Al_{12}$) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." ¶ 0026. Xiao discloses an "a mixture of magnesium or a magnesium alloy and an additive material, said additive material includes one or more metals selected from the group consisting of a) copper wherein said copper constitutes at least 0.01 wt. % of said dissolvable magnesium cast composite, b)	A POSITA in August 2014 would have understood this disclosure to mean a "a mixture of magnesium or a magnesium alloy and an additive material, said additive material includes one or more metals selected from the group consisting of a) copper wherein said copper constitutes at least 0.01 wt. % of said dissolvable magnesium cast composite, b) nickel wherein said nickel constitutes at least 0.01 wt. % of said dissolvable magnesium cast composite, and c) cobalt wherein said cobalt constitutes at least 0.01 wt. % of said dissolvable magnesium cast composite, ..." Thus, this claim element was rendered obvious by Xiao.		None of the references recite this limitation.

	nickel wherein said nickel constitutes at least 0.01 wt. % of said dissolvable magnesium cast composite, and c) cobalt wherein said cobalt constitutes at least 0.01 wt. % of said dissolvable magnesium cast composite, …" Thus, this claim element was anticipated by Xiao.			
<u>'740 Patent Claims</u>	**<u>Anticipated by CN 103343271 A Xiao et al.</u>**	**<u>At Least Made Obvious By CN 103343271 A Xiao et al.</u>**	**<u>Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag…</u>**	**<u>Terves' Response</u>**
said magnesium composite includes in situ precipitate,	Xiao discloses a "composite includes in situ precipitate, …" Thus, this claim element was anticipated by Xiao.	A POSITA in August 2014 would have understood this disclosure to mean "composite includes in situ precipitate, …" Thus, this claim element was rendered obvious by Xiao.		None of the references recite this limitation.
said in situ precipitate includes said additive material, a plurality of particles of said in situ precipitate having a size of no more than 50 μm,	Xiao discloses a "additive material, a plurality of particles of said in situ precipitate having a size of no more than 50 μm, …." Thus, this claim element was anticipated by Xiao.	A POSITA in August 2014 would have understood this disclosure to mean "additive material, a plurality of particles of said in situ precipitate having a size of no more than 50 μm, …." Thus, this claim element was rendered obvious by Xiao.		None of the references recite this limitation.

said magnesium composite has a dissolution rate of at least 5 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	Xiao discloses a "magnesium as the basis of our study; by means of adjusting the chemical composition and preparation process and using an industrial production method, a light and pressure-proof fast-decomposed cast magnesium alloy is prepared, which is able to meet the requirements for the decomposition of a tripping ball used in the multi-stage sliding sleeve staged-fracturing technique." Xiao ¶ 0005. Xiao discloses a "a magnesium alloy with a high aluminum content (13 to 25% by weight) and a high zinc content (2 to 10% by weight), and further adds elements of Fe, Cu, Ni and Ag which can enhance the corrosion performance of the magnesium alloy, and at the same time adds Zr, Ti element as grain refiners to improve the compressive strength of the formed material, in which the purpose of adding the high content of aluminum content is to produce a large amount of cathode phase, the B (Mg17Al12) phase and eutectic phase on the grain boundary of the magnesium alloy, and the magnesium matrix o phase functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which greatly accelerate	Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. A POSITA in August 2014 would have understood this disclosure to mean "of at least 5 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." Thus, this claim element was rendered obvious by Xiao.	As set forth in Ground I, supra, Xiao already discloses each and every element of the magnesium composition of Claim 1. Xiao does not disclose subjecting that magnesium composite to deformation processing. Hassan explicitly discloses deformation processing. In particular, Hassan discloses that the deposited magnesium ingots may then be subjected to secondary processing. For example, Hassan teaches that the nickel-reinforced magnesium ingots are machined and hot extruded to obtain rods of 8 mm diameter. Id. Analysis of the composite of Hassan "showed the reduction in the size of elemental nickel particulates in the extruded composites" (see Table 1 (from Hassan (above)). In other words, the extrusion in Hassan resulted in a reduction of grain size of the magnesium composite. A POSITA in April 2014 would have been motivated to combine the disclosure of Xiao with this disclosure of deformation processing in Hassan rendering Claim 7 obvious.	None of the references recite this limitation.

	the corrosion decomposition of magnesium alloy." Xiao ¶ 0026. Further, Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. Thus, this claim element was anticipated by Xiao.		Thus, this claim element was rendered obvious by Xiao in view of Hassan.	
'740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
20. The dissolvable magnesium cast composite as defined in claim 19, wherein said magnesium composite includes at least 85 wt. % magnesium.	Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. Xiao discloses a "magnesium composite includes at least 85 wt. % magnesium." Thus, this claim element was anticipated by Xiao.			None of the references recite this limitation.

21. The dissolvable magnesium cast composite as defined in claim 19, wherein said magnesium composite has a dissolution rate of at least 40 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	Xiao discloses a "a magnesium alloy ... is to produce a large amount of cathode phase, the B ($Mg_{17}Al_{12}$) phase and eutectic phase on the grain boundary of the magnesium alloy, and the magnesium matrix o phase functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which greatly accelerate the corrosion decomposition of magnesium alloy." Xiao ¶ 0026. Further, Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. Thus, this claim element was anticipated by Xiao.	Xiao discloses a "a magnesium alloy ... is to produce a large amount of cathode phase, the B ($Mg_{17}Al_{12}$) phase and eutectic phase on the grain boundary of the magnesium alloy, and the magnesium matrix o phase functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which greatly accelerate the corrosion decomposition of magnesium alloy." Xiao ¶ 0026. Further, Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. A POSITA in August 2014 would have understood this disclosure to mean "dissolution rate of at least 40 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C."		None of the references recite this limitation.

		Thus, this claim element was rendered obvious by Xiao.		
’740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
22. The dissolvable magnesium cast composite as defined in claim 20, wherein said magnesium composite has a dissolution rate of at least 40 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	Xiao discloses “a magnesium alloy … is to produce a large amount of cathode phase, the B (Mg17Al12) phase and eutectic phase on the grain boundary of the magnesium alloy, and the magnesium matrix o phase functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which greatly accelerate the corrosion decomposition of magnesium alloy.” Xiao ¶ 0026. Further, Xiao discloses a “decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy).” Xiao ¶ 0028. Thus, this claim element was anticipated by Xiao.	Xiao discloses “a magnesium alloy … is to produce a large amount of cathode phase, the B (Mg17Al12) phase and eutectic phase on the grain boundary of the magnesium alloy, and the magnesium matrix o phase functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which greatly accelerate the corrosion decomposition of magnesium alloy.” Xiao ¶ 0026. Further, Xiao discloses a “decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy).” Xiao ¶ 0028.		None of the references recite this limitation.

		A POSITA in August 2014 would have understood this disclosure to mean "magnesium composite has a dissolution rate of at least 40 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." Thus, this claim element was rendered obvious by Xiao.		
'740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
23. The dissolvable magnesium cast composite as defined in claim 19, wherein said magnesium composite includes no more than 10 wt. % aluminum.	Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. Xiao discloses "a magnesium alloy with a high aluminum content (13 to 25% by weight)" Xiao ¶ 0026. Xiao also discloses "trace element components are an Al-Fe intermediate alloy, an Al-Ni intermediate alloy, an Al-Cu intermediate alloy, an Al-Ag intermediate alloy, an Al-Zr intermediate alloy, and an Al-Ti intermediate alloy, ..." Xiao Claim 9.	Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. Xiao discloses "a magnesium alloy with a high aluminum content (13 to 25% by weight)" Xiao ¶ 0026. Xiao also discloses "trace element components are an Al-Fe intermediate alloy, an Al-Ni intermediate alloy, an Al-Cu intermediate alloy, an Al-Ag intermediate alloy, an		None of the references recite this limitation.

	Thus, this claim element was anticipated by Xiao.	Al-Zr intermediate alloy, and an Al-Ti intermediate alloy, ….” Xiao Claim 9. Xiao discloses “a magnesium alloy with a high aluminum content (13 to 25% by weight) and” Xiao ¶ 0026. A POSITA in August 2014 would have understood this disclosure to mean “magnesium composite includes no more than 10 wt. % aluminum.” Thus, this claim element was rendered obvious by Xiao.		
’740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag…**	**Terves’ Response**
24. The dissolvable magnesium cast composite as defined in claim 20, wherein said magnesium composite includes no more than 10 wt. % aluminum.	Xiao discloses a “light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg.” Xiao ¶ 0026. Xiao Abstract.	Xiao discloses a “a magnesium alloy with a high aluminum content (13 to 25% by weight) and” Xiao ¶ 0026. A POSITA in August 2014 would have understood this disclosure to mean “magnesium composite includes no more than 10 wt. % aluminum.” Thus, this claim element was rendered obvious by Xiao.		None of the references recite this limitation.

	Xiao discloses "a magnesium alloy with a high aluminum content (13 to 25% by weight)" Xiao ¶ 0026. Xiao also discloses "trace element components are an Al-Fe intermediate alloy, an Al-Ni intermediate alloy, an Al-Cu intermediate alloy, an Al-Ag intermediate alloy, an Al-Zr intermediate alloy, and an Al-Ti intermediate alloy, ..." Xiao Claim 9. Xiao discloses "a magnesium alloy with a high aluminum content (13 to 25% by weight)" Xiao ¶ 0026. Xiao discloses "trace element components are an Al-Fe intermediate alloy, an Al-Ni intermediate alloy, an Al-Cu intermediate alloy, an Al-Ag intermediate alloy, an Al-Zr intermediate alloy, and an Al-Ti intermediate alloy, ..." Xiao Claim 9. Thus, this claim element was anticipated by Xiao.			
'740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
25. The dissolvable magnesium cast composite as defined in claim 21, wherein said	Xiao discloses "a magnesium alloy with a high aluminum content (13 to 25% by weight)" Xiao ¶ 0026. Xiao discloses "trace element components are an Al-Fe	Xiao discloses a "a magnesium alloy with a high aluminum content (13 to 25% by weight) and" Xiao ¶ 0026. A POSITA in August 2014 would have		None of the references recite this limitation.

magnesium composite includes no more than 10 wt. % aluminum.	intermediate alloy, an Al-Ni intermediate alloy, an Al-Cu intermediate alloy, an Al-Ag intermediate alloy, an Al-Zr intermediate alloy, and an Al-Ti intermediate alloy, ….” Xiao Claim 9. Thus, this claim element was anticipated by Xiao.	understood this disclosure to mean "magnesium composite includes no more than 10 wt. % aluminum." Thus, this claim element was rendered obvious by Xiao.		
26. The dissolvable magnesium cast composite as defined in claim 22, wherein said magnesium composite includes no more than 10 wt. % aluminum.	Xiao discloses "a magnesium alloy with a high aluminum content (13 to 25% by weight)" Xiao ¶ 0026. Xiao discloses "trace element components are an Al-Fe intermediate alloy, an Al-Ni intermediate alloy, an Al-Cu intermediate alloy, an Al-Ag intermediate alloy, an Al-Zr intermediate alloy, and an Al-Ti intermediate alloy, ….” Xiao Claim 9. Thus, this claim element was anticipated by Xiao.	Xiao discloses a "a magnesium alloy with a high aluminum content (13 to 25% by weight) and" Xiao ¶ 0026. A POSITA in August 2014 would have understood this disclosure to mean "magnesium composite includes no more than 10 wt. % aluminum." Thus, this claim element was rendered obvious by Xiao.		None of the references recite this limitation.
<u>'740 Patent Claims</u>	**<u>Anticipated by CN 103343271 A Xiao et al.</u>**	**<u>At Least Made Obvious By CN 103343271 A Xiao et al.</u>**	**<u>Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag…</u>**	**<u>Terves' Response</u>**
27. The dissolvable magnesium cast composite as defined in claim	Xiao discloses "[a] light and pressure-proof fast-decomposed cast magnesium alloy, comprising the components at the weight	A POSITA in August 2014 would have understood this disclosure to mean "magnesium composite		None of the references recite this limitation.

23, wherein said magnesium composite includes at least 50 wt. % magnesium.	percentages as follows: Al: 13 to 25%, Zn: 2 to 15%, the remainder is Mg, and a sum of the weight percentages of the components is 100%." Xiao Claim 1. Xiao also discloses a "light and pressure-proof fast-decomposed cast magnesium alloy according to claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%. Xiao Claim 2. Thus, this claim element was anticipated by Xiao.	includes at least 50 wt. % magnesium." Thus, this claim element was rendered obvious by Xiao.		
28. The dissolvable magnesium cast composite as defined in claim 25, wherein said magnesium composite includes at least 50 wt. % magnesium.	Xiao discloses "[a] light and pressure-proof fast-decomposed cast magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%, the remainder is Mg, and a sum of the weight percentages of the components is 100%." Xiao Claim 1. Xiao also discloses a "light and pressure-proof fast-decomposed cast magnesium alloy according to claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%. Xiao Claim 2.	A POSITA in August 2014 would have understood this disclosure to mean "magnesium composite includes at least 50 wt. % magnesium." Thus, this claim element was rendered obvious by Xiao.		None of the references recite this limitation.

	Thus, this claim element was anticipated by Xiao.			
’740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
29. The dissolvable magnesium cast composite as defined in claim 19, wherein said dissolvable magnesium cast composite has a dissolution rate of 40-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	Xiao discloses “a magnesium alloy ... is to produce a large amount of cathode phase, the B (Mg17Al12) phase and eutectic phase on the grain boundary of the magnesium alloy, and the magnesium matrix o phase functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which greatly accelerate the corrosion decomposition of magnesium alloy.” Xiao ¶ 0026. Further, Xiao discloses a “decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy).” Xiao ¶ 0028. Thus, this claim element was anticipated by Xiao.	A POSITA in August 2014 would have understood this disclosure to mean “a dissolution rate of 40-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.” Thus, this claim element was rendered obvious by Xiao.		None of the references recite this limitation.
’740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A**	**Obvious over CN 103343271 A Xiao et al.**	**Terves’ Response**

		Xiao et al.	in view of Hassan, Development of High Strength Mag...	
30. The dissolvable magnesium cast composite as defined in claim 20, wherein said dissolvable magnesium cast composite has a dissolution rate of 40-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	Xiao discloses "a magnesium alloy ... is to produce a large amount of cathode phase, the B (Mg17Al12) phase and eutectic phase on the grain boundary of the magnesium alloy, and the magnesium matrix o phase functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which greatly accelerate the corrosion decomposition of magnesium alloy." Xiao ¶ 0026. Further, Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. Thus, this claim element was anticipated by Xiao.	A POSITA in August 2014 would have understood this disclosure to mean "a dissolution rate of 40-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." Thus, this claim element was rendered obvious by Xiao.		None of the references recite this limitation.
'740 Patent Claims	Anticipated by CN 103343271 A Xiao et al.	At Least Made Obvious By CN 103343271 A Xiao et al.	Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...	Terves' Response

31. The dissolvable magnesium cast composite as defined in claim 22, wherein said dissolvable magnesium cast composite has a dissolution rate of 40-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	Xiao discloses "a magnesium alloy … is to produce a large amount of cathode phase, the B (Mgi7Al12) phase and eutectic phase on the grain boundary of the magnesium alloy, and the magnesium matrix o phase functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which greatly accelerate the corrosion decomposition of magnesium alloy." Xiao ¶ 0026. Further, Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. Thus, this claim element was anticipated by Xiao.	A POSITA in August 2014 would have understood this disclosure to mean "a dissolution rate of 40-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." Thus, this claim element was rendered obvious by Xiao.		None of the references recite this limitation.
'740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag…**	**Terves' Response**
32. The dissolvable magnesium cast composite as defined in claim 23, wherein said	Xiao discloses "a magnesium alloy … is to produce a large amount of cathode phase, the B (Mgi7Al12) phase and eutectic phase on the grain boundary of the magnesium	A POSITA in August 2014 would have understood this disclosure to mean "a dissolution rate of 40-325		None of the references recite this limitation.

dissolvable magnesium cast composite has a dissolution rate of 40-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	alloy, and the magnesium matrix α phase functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which greatly accelerate the corrosion decomposition of magnesium alloy." Xiao ¶ 0026. Further, Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. Thus, this claim element was anticipated by Xiao.	mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." Thus, this claim element was rendered obvious by Xiao.		
’740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
33. The dissolvable magnesium cast composite as defined in claim	Xiao discloses "a magnesium alloy ... is to produce a large amount of cathode phase, the β ($Mg_{17}Al_{12}$) phase and eutectic phase on the	A POSITA in August 2014 would have understood this disclosure to mean "a dissolution rate of 40-325		None of the references recite this limitation.

27, wherein said dissolvable magnesium cast composite has a dissolution rate of 40-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	grain boundary of the magnesium alloy, and the magnesium matrix o phase functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which greatly accelerate the corrosion decomposition of magnesium alloy." Xiao ¶ 0026. Further, Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. Thus, this claim element was anticipated by Xiao.	mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." Thus, this claim element was rendered obvious by Xiao.		
34. The dissolvable magnesium cast composite as defined in claim 28, wherein said dissolvable magnesium cast composite has a dissolution rate of 40-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	Xiao discloses "a magnesium alloy … is to produce a large amount of cathode phase, the B (Mgi7Al12) phase and eutectic phase on the grain boundary of the magnesium alloy, and the magnesium matrix o phase functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which greatly accelerate the corrosion decomposition of magnesium alloy." Xiao ¶ 0026.	A POSITA in August 2014 would have understood this disclosure to mean "40-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." Thus, this claim element was rendered obvious by Xiao.		None of the references recite this limitation.

	Further, Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. Thus, this claim element was anticipated by Xiao.			
'740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
35. The dissolvable magnesium cast composite as defined in claim 27, wherein said magnesium alloy includes over 50 wt. % magnesium and one or more metals selected from the group consisting of aluminum, boron, bismuth, zinc, zirconium, and manganese.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "over 50 wt. % magnesium and one or more metals selected from the group consisting of aluminum,		None of the references recite this limitation.

		boron, bismuth, zinc, zirconium, and manganese." It would have been obvious to a PHOSITA to include both Mg and Mn as both are subject to similar corrosion behavior. Based on the combination of "aluminum, boron, bismuth, zinc, zirconium, and manganese" it would have been obvious to a PHOSITA to include boron and bismuth, Thus, this claim element was rendered obvious by Xiao.		
'740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
36. The dissolvable magnesium cast composite as defined in claim 28, wherein said magnesium alloy includes over 50 wt. % magnesium and one or more metals selected from the group consisting of aluminum, boron, bismuth, zinc, zirconium, and manganese.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "over 50 wt. % magnesium and one or more metals selected from the		None of the references recite this limitation.

		group consisting of aluminum, boron, bismuth, zinc, zirconium, and manganese." It would have been obvious to a PHOSITA to include both Mg and Mn as both are subject to similar corrosion behavior. Based on the combination of "aluminum, boron, bismuth, zinc, zirconium, and manganese" it would have been obvious to a PHOSITA to include boron and bismuth, Thus, this claim element was rendered obvious by Xiao.		
'740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag…**	**Terves' Response**
37. The dissolvable magnesium cast composite as defined in claim 27, wherein said magnesium alloy includes over 50 wt. % magnesium and one or more metals selected from the group consisting of aluminum in an amount of 0.5-10 wt. %, zinc in an amount of 0.1-6 wt.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "over 50		None of the references recite this limitation.

%, zirconium in an amount of 0.01-3 wt. %, manganese in an amount of 0.15-2 wt. %, boron in an amount of 0.0002-0.04 wt. %, and bismuth in an amount of 0.4-0.7 wt. %.		wt. % magnesium and one or more metals selected from the group consisting of aluminum in an amount of 0.5-10 wt. %, zinc in an amount of 0.1-6 wt. %, zirconium in an amount of 0.01-3 wt. %, manganese in an amount of 0.15-2 wt. %, boron in an amount of 0.0002-0.04 wt. %, and bismuth in an amount of 0.4-0.7 wt. %." It would have been obvious to a PHOSITA to include both Mg and Mn as both are subject to similar corrosion behavior. Based on the combination of "aluminum, boron, bismuth, zinc, zirconium, and manganese" it would have been obvious to a PHOSITA to include boron and bismuth in the indicated concentrations Thus, this claim element was rendered obvious by Xiao.		
'740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**

38. The dissolvable magnesium cast composite as defined in claim 28, wherein said magnesium alloy includes over 50 wt. % magnesium and one or more metals selected from the group consisting of aluminum in an amount of 0.5-10 wt. %, zinc in an amount of 0.1-6 wt. %, zirconium in an amount of 0.01-3 wt. %, manganese in an amount of 0.15-2 wt. %, boron in an amount of 0.0002-0.04 wt. %, and bismuth in an amount of 0.4-0.7 wt. %.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "over 50 wt. % magnesium and one or more metals selected from the group consisting of aluminum in an amount of 0.5-10 wt. %, zinc in an amount of 0.1-6 wt. %, zirconium in an amount of 0.01-3 wt. %, manganese in an amount of 0.15-2 wt. %, boron in an amount of 0.0002-0.04 wt. %, and bismuth in an amount of 0.4-0.7 wt. %." It would have been obvious to a PHOSITA to include both Mg and Mn as both are subject to similar corrosion behavior. Based on the combination of "aluminum, boron, bismuth, zinc, zirconium, and manganese" it would have been obvious to a PHOSITA to		None of the references recite this limitation.

		include boron and bismuth in the indicated concentrations Thus, this claim element was rendered obvious by Xiao.		
’740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag…**	**Terves’ Response**
39. The dissolvable magnesium cast composite as defined in claim 27, wherein said magnesium alloy includes over 50 wt. % magnesium and one or more metals selected from the group consisting of aluminum in an amount of 0.5-10 wt. %, zinc in an amount of 0.1-3 wt. %, zirconium in an amount of 0.01-1 wt. %, manganese in an amount of 0.15-2 wt. %, boron in an amount of 0.0002-0.04 wt. %, and bismuth in amount of 0.4-0.7 wt. %.		Xiao discloses a “light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg.” Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean “over 50 wt. % magnesium and one or more metals selected from the group consisting of aluminum in an amount of 0.5-10 wt. %, zinc in an amount of 0.1-6 wt. %, zirconium in an amount of 0.01-3 wt. %, manganese in an amount of 0.15-2 wt. %, boron in an amount of 0.0002-0.04 wt. %, and bismuth in an amount of 0.4-0.7 wt. %.” It would have been obvious to a		None of the references recite this limitation.

		PHOSITA to include both Mg and Mn as both are subject to similar corrosion behavior. Based on the combination of "aluminum, boron, bismuth, zinc, zirconium, and manganese" it would have been obvious to a PHOSITA to include boron and bismuth in the indicated concentrations. Thus, this claim element was rendered obvious by Xiao.		
'740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
40. The dissolvable magnesium cast composite as defined in claim 28, wherein said magnesium alloy includes over 50 wt. % magnesium and one or more metals selected from the group consisting of aluminum in an amount of 0.5-10 wt. %, zinc in an amount of 0.1-3 wt. %, zirconium in an amount of 0.01-1 wt. %, manganese		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "over 50 wt. % magnesium and one or more metals selected from the group consisting of aluminum in an amount of 0.5-10 wt. %,		None of the references recite this limitation.

in an amount of 0.15-2 wt. %, boron in an amount of 0.0002-0.04 wt. %, and bismuth in amount of 0.4-0.7 wt. %.		zinc in an amount of 0.1-6 wt. %, zirconium in an amount of 0.01-3 wt. %, manganese in an amount of 0.15-2 wt. %, boron in an amount of 0.0002-0.04 wt. %, and bismuth in an amount of 0.4-0.7 wt. %." It would have been obvious to a PHOSITA to include both Mg and Mn as both are subject to similar corrosion behavior. Based on the combination of "aluminum, boron, bismuth, zinc, zirconium, and manganese" it would have been obvious to a PHOSITA to include boron and bismuth in the indicated concentrations Thus, this claim element was rendered obvious by Xiao.		
’740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag…**	**Terves’ Response**
41. The dissolvable magnesium cast composite as defined in claim 20, wherein said magnesium alloy includes at least 85 wt. % magnesium and one or more metals selected from the group		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder		None of the references recite this limitation.

consisting of 0.5-10 wt. % aluminum, 0.05-6 wt. % zinc, 0.01-3 wt. % zirconium, and 0.15-2 wt. % manganese.		is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "includes at least 85 wt. % magnesium and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.05-6 wt. % zinc, 0.01-3 wt. % zirconium, and 0.15-2 wt. % manganese." It would have been obvious to a PHOSITA to include both Mg and Mn as both are subject to similar corrosion behavior. Based on the combination of "aluminum, boron, bismuth, zinc, zirconium, and manganese" it would have been obvious to a PHOSITA to include boron and bismuth in the indicated concentrations Thus, this claim element was rendered obvious by Xiao.		
'740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
42. The dissolvable magnesium cast composite as defined in claim 22, wherein said magnesium alloy		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1		None of the references recite this limitation.

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includes at least 85 wt. % magnesium and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.05-6 wt. % zinc, 0.01-3 wt. % zirconium, and 0.15-2 wt. % manganese.		to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "includes at least 85 wt. % magnesium and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.05-6 wt. % zinc, 0.01-3 wt. % zirconium, and 0.15-2 wt. % manganese." It would have been obvious to a PHOSITA to include both Mg and Mn as both are subject to similar corrosion behavior. Thus, this claim element was rendered obvious by Xiao.		
'740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
43. The dissolvable magnesium cast composite as defined in claim 23, wherein said magnesium alloy includes at least 85 wt. % magnesium and one or more		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to		None of the references recite this limitation.

metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.05-6 wt. % zinc, 0.01-3 wt. % zirconium, and 0.15-2 wt. % manganese.		0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "includes at least 85 wt. % magnesium and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.05-6 wt. % zinc, 0.01-3 wt. % zirconium, and 0.15-2 wt. % manganese." It would have been obvious to a PHOSITA to include both Mg and Mn as both are subject to similar corrosion behavior. Thus, this claim element was rendered obvious by Xiao.		
<u>'740 Patent Claims</u>	**<u>Anticipated by CN 103343271 A Xiao et al.</u>**	**<u>At Least Made Obvious By CN 103343271 A Xiao et al.</u>**	**<u>Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...</u>**	**<u>Terves' Response</u>**
44. The dissolvable magnesium cast composite as defined in claim 27, wherein said magnesium alloy comprises greater than 50 wt. % magnesium and one or more metals selected from the group		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract.		None of the references recite this limitation.

consisting of 0.5-10 wt. % aluminum, 0.1-2 wt. % zinc, 0.01-1 wt. % zirconium, and 0.15-2 wt. % manganese.		A POSITA in August 2014 would have understood this disclosure to mean "greater than 50 wt. % magnesium and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.1-2 wt. % zinc, 0.01-1 wt. % zirconium, and 0.15-2 wt. % manganese." It would have been obvious to a PHOSITA to include both Mg and Mn as both are subject to similar corrosion behavior. Thus, this claim element was rendered obvious by Xiao.		
'740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
45. The dissolvable magnesium cast composite as defined in claim 28, wherein said magnesium alloy comprises greater than 50 wt. % magnesium and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.1-2 wt. % zinc,		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "greater		None of the references recite this limitation.

0.01-1 wt. % zirconium, and 0.15-2 wt. % manganese.		than 50 wt. % magnesium and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.1-2 wt. % zinc, 0.01-1 wt. % zirconium, and 0.15-2 wt. % manganese." It would have been obvious to a PHOSITA to include both Mg and Mn as both are subject to similar corrosion behavior. Thus, this claim element was rendered obvious by Xiao.		
<u>'740 Patent Claims</u>	**<u>Anticipated by CN 103343271 A Xiao et al.</u>**	**<u>At Least Made Obvious By CN 103343271 A Xiao et al.</u>**	**<u>Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...</u>**	**<u>Terves' Response</u>**
46. The dissolvable magnesium cast composite as defined in claim 27, wherein said magnesium alloy comprises greater than 50 wt. % magnesium and one or more metals selected from the group consisting of 0.1-3 wt. % zinc, 0.05-1 wt. % zirconium, 0.05-0.25 wt. % manganese, 0.0002-0.04 wt. %		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "greater than 50 wt. % magnesium and one or more metals selected from the group consisting of		None of the references recite this limitation.

boron, and 0.4-0.7 wt. % bismuth.		0.1-3 wt. % zinc, 0.05-1 wt. % zirconium, 0.05-0.25 wt. % manganese, 0.0002-0.04 wt. % boron, and 0.4-0.7 wt. % bismuth." It would have been obvious to a PHOSITA to include both Mg and Mn as both are subject to similar corrosion behavior. It would have been obvious to a PHOSITA to include both B and Bi to the alloy. Based on the combination of "aluminum, boron, bismuth, zinc, zirconium, and manganese" it would have been obvious to a PHOSITA to include boron and bismuth in the indicated concentrations. Thus, this claim element was rendered obvious by Xiao.		
'740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
47. The dissolvable magnesium cast composite as defined in claim 28, wherein said magnesium alloy comprises greater than 50 wt. % magnesium and one or more		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder		None of the references recite this limitation.

metals selected from the group consisting of 0.1-3 wt. % zinc, 0.05-1 wt. % zirconium, 0.05-0.25 wt. % manganese, 0.0002-0.04 wt. % boron, and 0.4-0.7 wt. % bismuth.		is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "greater than 50 wt. % magnesium and one or more metals selected from the group consisting of 0.1-3 wt. % zinc, 0.05-1 wt. % zirconium, 0.05-0.25 wt. % manganese, 0.0002-0.04 wt. % boron, and 0.4-0.7 wt. % bismuth." It would have been obvious to a PHOSITA to include both Mg and Mn as both are subject to similar corrosion behavior. It would have been obvious to a PHOSITA to include both B and Bi to the alloy. Based on the combination of "aluminum, boron, bismuth, zinc, zirconium, and manganese" it would have been obvious to a PHOSITA to include boron and bismuth in the indicated concentrations. Thus, this claim element was rendered obvious by Xiao.		
’740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag…**	**Terves’ Response**

49. The dissolvable magnesium cast composite as defined in claim 19, wherein said magnesium alloy includes 60-95 wt. % magnesium and 0.01-1 wt. % zirconium.	Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. Thus, this claim element was anticipated by Xiao.			None of the references recite this limitation.
'740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
50. The dissolvable magnesium cast composite as defined in claim 19, wherein said magnesium alloy includes 60-95 wt. % magnesium, 0.05-6 wt. % zinc, and 0.01-1 wt. % zirconium.	Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. Thus, this claim element was anticipated by Xiao.			None of the references recite this limitation.
51. The dissolvable magnesium cast composite as defined in claim 19, wherein said		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to		None of the references recite this limitation.

magnesium alloy includes over 50 wt. % magnesium and one or more metals selected from the group consisting of 0.1-3 wt. % zinc, 0.01-1 wt. % zirconium, 0.05-1 wt. % manganese, 0.0002-0.04 wt. % boron, and 0.4-0.7 wt. % bismuth.		25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "includes over 50 wt. % magnesium and one or more metals selected from the group consisting of 0.1-3 wt. % zinc, 0.01-1 wt. % zirconium, 0.05-1 wt. % manganese, 0.0002-0.04 wt. % boron, and 0.4-0.7 wt. % bismuth." It would have been obvious to a PHOSITA to include both Mg and Mn as both are subject to similar corrosion behavior. It would have been obvious to a PHOSITA to include both B and Bi to the alloy. Based on the combination of "aluminum, boron, bismuth, zinc, zirconium, and manganese" it would have been obvious to a PHOSITA to include boron and bismuth in the indicated concentrations. Thus, this claim element was rendered obvious by Xiao.		
’740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al.**	**Terves’ Response**

			in view of Hassan, Development of High Strength Mag...	
52. The dissolvable magnesium cast composite as defined in claim 19, wherein said additive material includes nickel, said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "additive material includes nickel, said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite." It would have been obvious to a PHOSITA to include 0.1-23.5 wt. % Ni. Thus, this claim element was rendered obvious by Xiao.		None of the references recite this limitation.
'740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**

53. The dissolvable magnesium cast composite as defined in claim 20, wherein said additive material includes nickel, said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "additive material includes nickel, said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite." It would have been obvious to a PHOSITA to include 0.1-23.5 wt. % Ni. Thus, this claim element was rendered obvious by Xiao.		None of the references recite this limitation.
<u>'740 Patent Claims</u>	**<u>Anticipated by CN 103343271 A Xiao et al.</u>**	**<u>At Least Made Obvious By CN 103343271 A Xiao et al.</u>**	**<u>Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...</u>**	**<u>Terves' Response</u>**
54. The dissolvable magnesium cast composite as defined in claim 22, wherein said additive material includes nickel,		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu,		None of the references recite this limitation.

said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite.		0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "additive material includes nickel, said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite." It would have been obvious to a PHOSITA to include 0.1-23.5 wt. % Ni. Thus, this claim element was rendered obvious by Xiao.		
’740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
55. The dissolvable magnesium cast composite as defined in claim 23, wherein said additive material includes nickel, said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this		None of the references recite this limitation.

		disclosure to mean "additive material includes nickel, said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite." It would have been obvious to a PHOSITA to include 0.1-23.5 wt. % Ni. Thus, this claim element was rendered obvious by Xiao.		
'740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
56. The dissolvable magnesium cast composite as defined in claim 27, wherein said additive material includes nickel, said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "additive material includes nickel, said nickel constitutes 0.1-23.5 wt. % of said dissolvable		None of the references recite this limitation.

		magnesium cast composite." It would have been obvious to a PHOSITA to include 0.1-23.5 wt. % Ni. Thus, this claim element was rendered obvious by Xiao.		
57. The dissolvable magnesium cast composite as defined in claim 28, wherein said wherein said additive material includes nickel, said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "additive material includes nickel, said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite." It would have been obvious to a PHOSITA to include 0.1-23.5 wt. % Ni. Thus, this claim element was rendered obvious by Xiao.		None of the references recite this limitation.
’740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag…**	**Terves’ Response**

58. The dissolvable magnesium cast composite as defined in claim 19, wherein said additive material includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite." It would have been obvious to a PHOSITA to include 0.01-35 wt. % Cu. Thus, this claim element was rendered obvious by Xiao.		None of the references recite this limitation.
'740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
59. The dissolvable magnesium cast composite as defined in claim		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the		None of the references recite this limitation.

20, wherein said additive material includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite.		following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite." It would have been obvious to a PHOSITA to include 0.01-35 wt. % Cu. Thus, this claim element was rendered obvious by Xiao.		
'740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
60. The dissolvable magnesium cast composite as defined in claim 22, wherein said additive material includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract.		None of the references recite this limitation.

magnesium cast composite.		A POSITA in August 2014 would have understood this disclosure to mean "includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite." It would have been obvious to a PHOSITA to include 0.01-35 wt. % Cu. Thus, this claim element was rendered obvious by Xiao.		
61. The dissolvable magnesium cast composite as defined in claim 23, wherein said additive material includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite." It would have been obvious to a PHOSITA to include 0.01-35 wt. % Cu. Thus, this claim element was rendered obvious by Xiao.		None of the references recite this limitation.

'740 Patent Claims	Anticipated by CN 103343271 A Xiao et al.	At Least Made Obvious By CN 103343271 A Xiao et al.	Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...	Terves' Response
62. The dissolvable magnesium cast composite as defined in claim 17, wherein said additive material includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite." It would have been obvious to a PHOSITA to include 0.01-35 wt. % Cu. Thus, this claim element was rendered obvious by Xiao.		None of the references recite this limitation.
'740 Patent Claims	Anticipated by CN 103343271 A Xiao et al.	At Least Made Obvious By CN 103343271 A Xiao et al.	Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...	Terves' Response

63. The dissolvable magnesium cast composite as defined in claim 28, wherein said additive material includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite." It would have been obvious to a PHOSITA to include 0.01-35 wt. % Cu. Thus, this claim element was rendered obvious by Xiao.		None of the references recite this limitation.
’740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
64. The dissolvable magnesium cast composite as defined in claim 19, wherein said additive material includes copper, said copper		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of		None of the references recite this limitation.

constitutes 0.5-15 wt. % of said dissolvable magnesium cast composite.		Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite." It would have been obvious to a PHOSITA to include 0.5-15 wt. % Cu. Thus, this claim element was rendered obvious by Xiao.		
’740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
65. The dissolvable magnesium cast composite as defined in claim 20, wherein said additive material includes copper, said copper constitutes 0.5-15 wt. % of said dissolvable		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract.		None of the references recite this limitation.

magnesium cast composite.		A POSITA in August 2014 would have understood this disclosure to mean "includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite." It would have been obvious to a PHOSITA to include 0.5-15 wt. % Cu. Thus, this claim element was rendered obvious by Xiao.		
66. The dissolvable magnesium cast composite as defined in claim 22, wherein said additive material includes copper, said copper constitutes 0.5-15 wt. % of said dissolvable magnesium cast composite.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite." It would have been obvious to a PHOSITA to include 0.5-15 wt. % Cu. Thus, this claim element was rendered obvious by Xiao.		None of the references recite this limitation.
’740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A**	**Obvious over CN 103343271 A Xiao et al.**	**Terves’ Response**

		Xiao et al.	**in view of Hassan, Development of High Strength Mag...**	
67. The dissolvable magnesium cast composite as defined in claim 23, wherein said additive material includes copper, said copper constitutes 0.5-15 wt. % of said dissolvable magnesium cast composite.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite." It would have been obvious to a PHOSITA to include 0.5-15 wt. % Cu. Thus, this claim element was rendered obvious by Xiao.		None of the references recite this limitation.
'740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
68. The dissolvable magnesium cast composite as		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium		None of the references recite this limitation.

defined in claim 27, wherein said additive material includes copper, said copper constitutes 0.5-15 wt. % of said dissolvable magnesium cast composite.		alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite." It would have been obvious to a PHOSITA to include 0.5-15 wt. % Cu. Thus, this claim element was rendered obvious by Xiao.		
’740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
69. The dissolvable magnesium cast composite as defined in claim 28, wherein said additive material includes copper, said copper constitutes 0.5-15		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to		None of the references recite this limitation.

wt. % of said dissolvable magnesium cast composite.		0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite." It would have been obvious to a PHOSITA to include 0.5-15 wt. % Cu. Thus, this claim element was rendered obvious by Xiao.		
76. The dissolvable magnesium cast composite as defined in claim 19, wherein said additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt." It would have been obvious to a PHOSITA to		None of the references recite this limitation.

		include Cu, Ni, and Co in the indicated concentrations. Thus, this claim element was rendered obvious by Xiao.		
'740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
77. The dissolvable magnesium cast composite as defined in claim 29, wherein said additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt." It would have been obvious to a PHOSITA to include Cu, Ni, and Co in the indicated concentrations. Thus, this claim element was rendered obvious by Xiao.		None of the references recite this limitation.

’740 Patent Claims	Anticipated by CN 103343271 A Xiao et al.	At Least Made Obvious By CN 103343271 A Xiao et al.	Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag…	Terves’ Response
78. The dissolvable magnesium cast composite as defined in claim 22, wherein said additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt.		Xiao discloses a “light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg.” Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean “additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt.” It would have been obvious to a PHOSITA to include Cu, Ni, and Co in the indicated concentrations. Thus, this claim element was rendered obvious by Xiao.		None of the references recite this limitation.
’740 Patent Claims	Anticipated by CN 103343271 A Xiao et al.	At Least Made Obvious By CN 103343271 A Xiao et al.	Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag…	Terves’ Response

79. The dissolvable magnesium cast composite as defined in claim 23, wherein said additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt." It would have been obvious to a PHOSITA to include Cu, Ni, and Co in the indicated concentrations. Thus, this claim element was rendered obvious by Xiao.		None of the references recite this limitation.
’740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
80. The dissolvable magnesium cast composite as		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium		None of the references recite this limitation.

defined in claim 27, wherein said additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt.		alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt." It would have been obvious to a PHOSITA to include Cu, Ni, and Co in the indicated concentrations. Thus, this claim element was rendered obvious by Xiao.		
’740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
81. The dissolvable magnesium cast composite as defined in claim 28, wherein said		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to		None of the references recite this limitation.

additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt.		25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt." It would have been obvious to a PHOSITA to include Cu, Ni, and Co in the indicated concentrations. Thus, this claim element was rendered obvious by Xiao.		
82. The dissolvable magnesium cast composite as defined in claim 19, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least		Xiao discloses "a magnesium alloy with a high aluminum content (13 to 25% by weight) and a high zinc content (2 to 10% by weight), and further adds elements of Fe, Cu, Ni and Ag which can enhance the corrosion performance of the magnesium alloy, and at the same time adds Zr, Ti element as grain refiners to improve the compressive strength of the formed material, ... The purpose of adding a high content of zinc to the	As set forth in Ground I, supra, Xiao already discloses each and every element of the magnesium composition of Claim 1. Xiao does not disclose subjecting that magnesium composite to deformation processing. Hassan explicitly discloses deformation processing. In particular, Hassan discloses that the deposited magnesium ingots may then be subjected to secondary processing. For example, Hassan teaches that	None of the references recite this limitation.

11 ksi, and c) an elongation of at least 3%.		magnesium alloy is to increase the strength of the magnesium alloy, ... The addition of the trace elements Zr and Ti can refine the magnesium alloy crystals, thereby increasing the compressive strength of the alloy. The room temperature tensile strength op of the light and pressure-proof fast-decomposed cast magnesium alloy prepared by the invention is 130 to 180 MPa higher than that of the existing AZ91D magnesium alloy, ...” Xiao at ¶ 0026. A POSITA in August 2014 would have understood this disclosure to mean “has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.” Thus, this claim element was rendered obvious by Xiao.	the nickel-reinforced magnesium ingots are machined and hot extruded to obtain rods of 8 mm diameter. Id. Analysis of the composite of Hassan “showed the reduction in the size of elemental nickel particulates in the extruded composites” (see Table 1 (from Hassan (above)). In other words, the extrusion in Hassan resulted in a reduction of grain size of the magnesium composite. A POSITA in April 2014 would have been motivated to combine the disclosure of Xiao with this disclosure of deformation processing in Hassan rendering Claim 7 obvious. Accordingly, Claim 7 should be found obvious over Xiao in view of Hassan.	
’740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
83. The dissolvable magnesium cast composite as		Xiao discloses “a magnesium alloy with a high aluminum content (13 to 25% by weight)	As set forth in Ground I, supra, Xiao already discloses each and every element of the	None of the references recite this limitation.

defined in claim 20, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.		and a high zinc content (2 to 10% by weight), and further adds elements of Fe, Cu, Ni and Ag which can enhance the corrosion performance of the magnesium alloy, and at the same time adds Zr, Ti element as grain refiners to improve the compressive strength of the formed material, … The purpose of adding a high content of zinc to the magnesium alloy is to increase the strength of the magnesium alloy, … The addition of the trace elements Zr and Ti can refine the magnesium alloy crystals, thereby increasing the compressive strength of the alloy. The room temperature tensile strength op of the light and pressure-proof fast-decomposed cast magnesium alloy prepared by the invention is 130 to 180 MPa higher than that of the existing AZ91D magnesium alloy, ….” Xiao at ¶ 0026. A POSITA in August 2014 would have understood this disclosure to mean "has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at	magnesium composition of Claim 1. Xiao does not disclose subjecting that magnesium composite to deformation processing. Hassan explicitly discloses deformation processing. In particular, Hassan discloses that the deposited magnesium ingots may then be subjected to secondary processing. For example, Hassan teaches that the nickel-reinforced magnesium ingots are machined and hot extruded to obtain rods of 8 mm diameter. Id. Analysis of the composite of Hassan "showed the reduction in the size of elemental nickel particulates in the extruded composites" (see Table 1 (from Hassan (above)). In other words, the extrusion in Hassan resulted in a reduction of grain size of the magnesium composite. A POSITA in April 2014 would have been motivated to combine the disclosure of Xiao with this disclosure of deformation processing in Hassan rendering Claim 7 obvious. Thus, this claim element was rendered obvious by Xiao in view of Hassan	

		least 11 ksi, and c) an elongation of at least 3%." Thus, this claim element was rendered obvious by Xiao.		
'740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
84. The dissolvable magnesium cast composite as defined in claim 22, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.		Xiao discloses "a magnesium alloy with a high aluminum content (13 to 25% by weight) and a high zinc content (2 to 10% by weight), and further adds elements of Fe, Cu, Ni and Ag which can enhance the corrosion performance of the magnesium alloy, and at the same time adds Zr, Ti element as grain refiners to improve the compressive strength of the formed material, ... The purpose of adding a high content of zinc to the magnesium alloy is to increase the strength of the magnesium alloy, ... The addition of the trace elements Zr and Ti can refine the magnesium alloy crystals, thereby increasing the compressive strength of the alloy. The room temperature tensile strength op of the light and pressure-proof fast-decomposed cast magnesium	As set forth in Ground I, supra, Xiao already discloses each and every element of the magnesium composition of Claim 1. Xiao does not disclose subjecting that magnesium composite to deformation processing. Hassan explicitly discloses deformation processing. In particular, Hassan discloses that the deposited magnesium ingots may then be subjected to secondary processing. For example, Hassan teaches that the nickel-reinforced magnesium ingots are machined and hot extruded to obtain rods of 8 mm diameter. Id. Analysis of the composite of Hassan "showed the reduction in the size of elemental nickel particulates in the extruded composites" (see Table 1 (from Hassan (above)). In other words, the extrusion in Hassan resulted	None of the references recite this limitation.

		alloy prepared by the invention is 130 to 180 MPa higher than that of the existing AZ91D magnesium alloy, ...” Xiao at ¶ 0026. A POSITA in August 2014 would have understood this disclosure to mean “has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.” Thus, this claim element was rendered obvious by Xiao.	in a reduction of grain size of the magnesium composite. A POSITA in April 2014 would have been motivated to combine the disclosure of Xiao with this disclosure of deformation processing in Hassan rendering Claim 7 obvious. Accordingly, this claim is obvious over Xiao in view of Hassan.	
’740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
85. The dissolvable magnesium cast composite as defined in claim 25, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least		Xiao discloses “a magnesium alloy with a high aluminum content (13 to 25% by weight) and a high zinc content (2 to 10% by weight), and further adds elements of Fe, Cu, Ni and Ag which can enhance the corrosion performance of the magnesium alloy, and at the same time adds Zr, Ti element as grain refiners to improve the compressive strength of the formed material, ... The purpose of adding a high content of zinc to the	As set forth in Ground I, supra, Xiao already discloses each and every element of the magnesium composition of Claim 1. Xiao does not disclose subjecting that magnesium composite to deformation processing. Hassan explicitly discloses deformation processing. In particular, Hassan discloses that the deposited magnesium ingots may then be subjected to secondary processing. For example, Hassan teaches that	None of the references recite this limitation.

'740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag…**	**Terves' Response**
11 ksi, and c) an elongation of at least 3%.		magnesium alloy is to increase the strength of the magnesium alloy, … The addition of the trace elements Zr and Ti can refine the magnesium alloy crystals, thereby increasing the compressive strength of the alloy. The room temperature tensile strength op of the light and pressure-proof fast-decomposed cast magnesium alloy prepared by the invention is 130 to 180 MPa higher than that of the existing AZ91D magnesium alloy, ….” Xiao at ¶ 0026. A POSITA in August 2014 would have understood this disclosure to mean “has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.” Thus, this claim element was rendered obvious by Xiao.	the nickel-reinforced magnesium ingots are machined and hot extruded to obtain rods of 8 mm diameter. Id. Analysis of the composite of Hassan “showed the reduction in the size of elemental nickel particulates in the extruded composites” (see Table 1 (from Hassan (above)). In other words, the extrusion in Hassan resulted in a reduction of grain size of the magnesium composite. A POSITA in April 2014 would have been motivated to combine the disclosure of Xiao with this disclosure of deformation processing in Hassan rendering Claim 7 obvious. Accordingly, Claim 7 should be found obvious over Xiao in view of Hassan.	

86. The dissolvable magnesium cast composite as defined in claim 27, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.		Xiao discloses "a magnesium alloy with a high aluminum content (13 to 25% by weight) and a high zinc content (2 to 10% by weight), and further adds elements of Fe, Cu, Ni and Ag which can enhance the corrosion performance of the magnesium alloy, and at the same time adds Zr, Ti element as grain refiners to improve the compressive strength of the formed material, ... The purpose of adding a high content of zinc to the magnesium alloy is to increase the strength of the magnesium alloy, ... The addition of the trace elements Zr and Ti can refine the magnesium alloy crystals, thereby increasing the compressive strength of the alloy. The room temperature tensile strength op of the light and pressure-proof fast-decomposed cast magnesium alloy prepared by the invention is 130 to 180 MPa higher than that of the existing AZ91D magnesium alloy, ..." Xiao at ¶ 0026. A POSITA in August 2014 would have understood this disclosure to mean "has one or more properties selected from the group consisting of a) a	As set forth in Ground I, supra, Xiao already discloses each and every element of the magnesium composition of Claim 1. Xiao does not disclose subjecting that magnesium composite to deformation processing. Hassan explicitly discloses deformation processing. In particular, Hassan discloses that the deposited magnesium ingots may then be subjected to secondary processing. For example, Hassan teaches that the nickel-reinforced magnesium ingots are machined and hot extruded to obtain rods of 8 mm diameter. Id. Analysis of the composite of Hassan "showed the reduction in the size of elemental nickel particulates in the extruded composites" (see Table 1 (from Hassan (above)). In other words, the extrusion in Hassan resulted in a reduction of grain size of the magnesium composite. A POSITA in April 2014 would have been motivated to combine the disclosure of Xiao with this disclosure of deformation processing in Hassan rendering Claim 7 obvious. Accordingly, Claim 7	None of the references recite this limitation.

EXHIBIT 19
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		tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%." Thus, this claim element was rendered obvious by Xiao.	should be found obvious over Xiao in view of Hassan.	
’740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
87. The dissolvable magnesium cast composite as defined in claim 28, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.		Xiao discloses "a magnesium alloy with a high aluminum content (13 to 25% by weight) and a high zinc content (2 to 10% by weight), and further adds elements of Fe, Cu, Ni and Ag which can enhance the corrosion performance of the magnesium alloy, and at the same time adds Zr, Ti element as grain refiners to improve the compressive strength of the formed material, ... The purpose of adding a high content of zinc to the magnesium alloy is to increase the strength of the magnesium alloy, ... The addition of the trace elements Zr and Ti can refine the magnesium alloy crystals, thereby increasing the compressive strength of the alloy. The room temperature tensile strength op of the light	As set forth in Ground I, supra, Xiao already discloses each and every element of the magnesium composition of Claim 1. Xiao does not disclose subjecting that magnesium composite to deformation processing. Hassan explicitly discloses deformation processing. In particular, Hassan discloses that the deposited magnesium ingots may then be subjected to secondary processing. For example, Hassan teaches that the nickel-reinforced magnesium ingots are machined and hot extruded to obtain rods of 8 mm diameter. Id. Analysis of the composite of Hassan "showed the reduction in the size of elemental nickel particulates in the extruded composites" (see Table 1 (from Hassan	None of the references recite this limitation.

		and pressure-proof fast-decomposed cast magnesium alloy prepared by the invention is 130 to 180 MPa higher than that of the existing AZ91D magnesium alloy, ...” Xiao at ¶ 0026. A POSITA in August 2014 would have understood this disclosure to mean “has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.” Thus, this claim element was rendered obvious by Xiao.	(above)). In other words, the extrusion in Hassan resulted in a reduction of grain size of the magnesium composite. A POSITA in April 2014 would have been motivated to combine the disclosure of Xiao with this disclosure of deformation processing in Hassan rendering Claim 7 obvious. Accordingly, Claim 7 should be found obvious over Xiao in view of Hassan.	
’740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
88. The dissolvable magnesium cast composite as defined in claim 19, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of		Xiao discloses “a magnesium alloy with a high aluminum content (13 to 25% by weight) and a high zinc content (2 to 10% by weight), and further adds elements of Fe, Cu, Ni and Ag which can enhance the corrosion performance of the magnesium alloy, and at the same time adds Zr, Ti element as grain refiners to improve	As set forth in Ground I, supra, Xiao already discloses each and every element of the magnesium composition of Claim 1. Xiao does not disclose subjecting that magnesium composite to deformation processing. Hassan explicitly discloses deformation processing. In particular, Hassan discloses	None of the references recite this limitation.

a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi, and c) an elongation of at least 3%.		the compressive strength of the formed material, … The purpose of adding a high content of zinc to the magnesium alloy is to increase the strength of the magnesium alloy, … The addition of the trace elements Zr and Ti can refine the magnesium alloy crystals, thereby increasing the compressive strength of the alloy. The room temperature tensile strength op of the light and pressure-proof fast-decomposed cast magnesium alloy prepared by the invention is 130 to 180 MPa higher than that of the existing AZ91D magnesium alloy, ….” Xiao at ¶ 0026. A POSITA in August 2014 would have understood this disclosure to mean “has one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi, and c) an elongation of at least 3%.” Thus, this claim element was rendered obvious by Xiao.	that the deposited magnesium ingots may then be subjected to secondary processing. For example, Hassan teaches that the nickel-reinforced magnesium ingots are machined and hot extruded to obtain rods of 8 mm diameter. Id. Analysis of the composite of Hassan “showed the reduction in the size of elemental nickel particulates in the extruded composites” (see Table 1 (from Hassan (above)). In other words, the extrusion in Hassan resulted in a reduction of grain size of the magnesium composite. A POSITA in April 2014 would have been motivated to combine the disclosure of Xiao with this disclosure of deformation processing in Hassan rendering Claim 7 obvious. Accordingly, Claim 7 should be found obvious over Xiao in view of Hassan.	
<u>’740 Patent Claims</u>	**<u>Anticipated by CN 103343271 A Xiao et al.</u>**	**<u>At Least Made Obvious By CN 103343271 A Xiao et al.</u>**	**<u>Obvious over CN 103343271 A Xiao et al.</u>**	**<u>Terves’ Response</u>**

			in view of Hassan, Development of High Strength Mag...	
89. The dissolvable magnesium cast composite as defined in claim 20, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi, and c) an elongation of at least 3%.		Xiao discloses "a magnesium alloy with a high aluminum content (13 to 25% by weight) and a high zinc content (2 to 10% by weight), and further adds elements of Fe, Cu, Ni and Ag which can enhance the corrosion performance of the magnesium alloy, and at the same time adds Zr, Ti element as grain refiners to improve the compressive strength of the formed material, ... The purpose of adding a high content of zinc to the magnesium alloy is to increase the strength of the magnesium alloy, ... The addition of the trace elements Zr and Ti can refine the magnesium alloy crystals, thereby increasing the compressive strength of the alloy. The room temperature tensile strength op of the light and pressure-proof fast-decomposed cast magnesium alloy prepared by theinvention is 130 to 180 MPa higher than that of the existing AZ91D magnesium alloy, ..." Xiao at ¶ 0026.	As set forth in Ground I, supra, Xiao already discloses each and every element of the magnesium composition of Claim 1. Xiao does not disclose subjecting that magnesium composite to deformation processing. Hassan explicitly discloses deformation processing. In particular, Hassan discloses that the deposited magnesium ingots may then be subjected to secondary processing. For example, Hassan teaches that the nickel-reinforced magnesium ingots are machined and hot extruded to obtain rods of 8 mm diameter. Id. Analysis of the composite of Hassan "showed the reduction in the size of elemental nickel particulates in the extruded composites" (see Table 1 (from Hassan (above)). In other words, the extrusion in Hassan resulted in a reduction of grain size of the magnesium composite. A POSITA in April 2014 would have been motivated to combine the disclosure of Xiao with this disclosure of	None of the references recite this limitation.

		A POSITA in August 2014 would have understood this disclosure to mean "has one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi, and c) an elongation of at least 3%." Thus, this claim element was rendered obvious by Xiao.	deformation processing in Hassan rendering Claim 7 obvious. Accordingly, Claim 7 should be found obvious over Xiao in view of Hassan.	
’740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
90. The dissolvable magnesium cast composite as defined in claim 22, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi, and c) an elongation of at least 3%.		Xiao discloses "a magnesium alloy with a high aluminum content (13 to 25% by weight) and a high zinc content (2 to 10% by weight), and further adds elements of Fe, Cu, Ni and Ag which can enhance the corrosion performance of the magnesium alloy, and at the same time adds Zr, Ti element as grain refiners to improve the compressive strength of the formed material, ... The purpose of adding a high content of zinc to the magnesium alloy is to increase the strength of the magnesium alloy, ... The addition of the trace elements Zr and Ti can refine the	As set forth in Ground I, supra, Xiao already discloses each and every element of the magnesium composition of Claim 1. Xiao does not disclose subjecting that magnesium composite to deformation processing. Hassan explicitly discloses deformation processing. In particular, Hassan discloses that the deposited magnesium ingots may then be subjected to secondary processing. For example, Hassan teaches that the nickel-reinforced magnesium ingots are machined and hot extruded to obtain rods of 8 mm diameter. Id. Analysis of the composite	None of the references recite this limitation.

		magnesium alloy crystals, thereby increasing the compressive strength of the alloy. The room temperature tensile strength σp of the light and pressure-proof fast-decomposed cast magnesium alloy prepared by the invention is 130 to 180 MPa higher than that of the existing AZ91D magnesium alloy, ...” Xiao at ¶ 0026. A POSITA in August 2014 would have understood this disclosure to mean “has one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi, and c) an elongation of at least 3%.” Thus, this claim element was rendered obvious by Xiao.	of Hassan “showed the reduction in the size of elemental nickel particulates in the extruded composites” (see Table 1 (from Hassan (above)). In other words, the extrusion in Hassan resulted in a reduction of grain size of the magnesium composite. A POSITA in April 2014 would have been motivated to combine the disclosure of Xiao with this disclosure of deformation processing in Hassan rendering Claim 7 obvious. Accordingly, Claim 7 should be found obvious over Xiao in view of Hassan.	
’740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
91. The dissolvable magnesium cast composite as defined in claim 23, wherein said dissolvable magnesium cast composite has one		Xiao discloses “a magnesium alloy with a high aluminum content (13 to 25% by weight) and a high zinc content (2 to 10% by weight), and further adds elements of Fe, Cu, Ni and Ag which can enhance the corrosion performance of the	As set forth in Ground I, supra, Xiao already discloses each and every element of the magnesium composition of Claim 1. Xiao does not disclose subjecting that magnesium composite to deformation processing.	None of the references recite this limitation.

or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi, and c) an elongation of at least 3%.		magnesium alloy, and at the same time adds Zr, Ti element as grain refiners to improve the compressive strength of the formed material, ... The purpose of adding a high content of zinc to the magnesium alloy is to increase the strength of the magnesium alloy, ... The addition of the trace elements Zr and Ti can refine the magnesium alloy crystals, thereby increasing the compressive strength of the alloy. The room temperature tensile strength op of the light and pressure-proof fast-decomposed cast magnesium alloy prepared by the invention is 130 to 180 MPa higher than that of the existing AZ91D magnesium alloy, ...” Xiao at ¶ 0026. A POSITA in August 2014 would have understood this disclosure to mean “has one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi, and c) an elongation of at least 3%.” Thus, this claim element was rendered obvious by Xiao.	Hassan explicitly discloses deformation processing. In particular, Hassan discloses that the deposited magnesium ingots may then be subjected to secondary processing. For example, Hassan teaches that the nickel-reinforced magnesium ingots are machined and hot extruded to obtain rods of 8 mm diameter. Id. Analysis of the composite of Hassan “showed the reduction in the size of elemental nickel particulates in the extruded composites” (see Table 1 (from Hassan (above)). In other words, the extrusion in Hassan resulted in a reduction of grain size of the magnesium composite. A POSITA in April 2014 would have been motivated to combine the disclosure of Xiao with this disclosure of deformation processing in Hassan rendering Claim 7 obvious. Accordingly, Claim 7 should be found obvious over Xiao in view of Hassan.	

’740 Patent Claims	Anticipated by CN 103343271 A Xiao et al.	At Least Made Obvious By CN 103343271 A Xiao et al.	Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...	Terves’ Response
92. The dissolvable magnesium cast composite as defined in claim 27, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi, and c) an elongation of at least 3%.		Xiao discloses “a magnesium alloy with a high aluminum content (13 to 25% by weight) and a high zinc content (2 to 10% by weight), and further adds elements of Fe, Cu, Ni and Ag which can enhance the corrosion performance of the magnesium alloy, and at the same time adds Zr, Ti element as grain refiners to improve the compressive strength of the formed material, ... The purpose of adding a high content of zinc to the magnesium alloy is to increase the strength of the magnesium alloy, ... The addition of the trace elements Zr and Ti can refine the magnesium alloy crystals, thereby increasing the compressive strength of the alloy. The room temperature tensile strength op of the light and pressure-proof fast-decomposed cast magnesium alloy prepared by the invention is 130 to 180 MPa	As set forth in Ground I, supra, Xiao already discloses each and every element of the magnesium composition of Claim 1. Xiao does not disclose subjecting that magnesium composite to deformation processing. Hassan explicitly discloses deformation processing. In particular, Hassan discloses that the deposited magnesium ingots may then be subjected to secondary processing. For example, Hassan teaches that the nickel-reinforced magnesium ingots are machined and hot extruded to obtain rods of 8 mm diameter. Id. Analysis of the composite of Hassan “showed the reduction in the size of elemental nickel particulates in the extruded composites” (see Table 1 (from Hassan (above)). In other words, the extrusion in Hassan resulted in a reduction of grain size of the magnesium composite.	None of the references recite this limitation.

		higher than that of the existing AZ91D magnesium alloy, ...” Xiao at ¶ 0026. A POSITA in August 2014 would have understood this disclosure to mean “has one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi, and c) an elongation of at least 3%.” Thus, this claim element was rendered obvious by Xiao.	A POSITA in April 2014 would have been motivated to combine the disclosure of Xiao with this disclosure of deformation processing in Hassan rendering Claim 7 obvious. Accordingly, Claim 7 should be found obvious over Xiao in view of Hassan.	
’740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
93. The dissolvable magnesium cast composite as defined in claim 28, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) ashear strength of 11-25 ksi, and c) an		Xiao discloses “a magnesium alloy with a high aluminum content (13 to 25% by weight) and a high zinc content (2 to 10% by weight), and further adds elements of Fe, Cu, Ni and Ag which can enhance the corrosion performance of the magnesium alloy, and at the same time adds Zr, Ti element as grain refiners to improve the compressive strength of the formed material, ... The purpose of adding a high content of zinc to the magnesium alloy is to increase the strength of the	As set forth in Ground I, supra, Xiao already discloses each and every element of the magnesium composition of Claim 1. Xiao does not disclose subjecting that magnesium composite to deformation processing. Hassan explicitly discloses deformation processing. In particular, Hassan discloses that the deposited magnesium ingots may then be subjected to secondary processing. For example, Hassan teaches that the nickel-reinforced magnesium ingots are	None of the references recite this limitation.

elongation of at least 3%.		magnesium alloy, ... The addition of the trace elements Zr and Ti can refine the magnesium alloy crystals, thereby increasing the compressive strength of the alloy. The room temperature tensile strength σb of the light and pressure-proof fast-decomposed cast magnesium alloy prepared by the invention is 130 to 180 MPa higher than that of the existing AZ91D magnesium alloy, ...” Xiao at ¶ 0026. A POSITA in August 2014 would have understood this disclosure to mean “has one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi, and c) an elongation of at least 3%.” Thus, this claim element was rendered obvious by Xiao.	machined and hot extruded to obtain rods of 8 mm diameter. Id. Analysis of the composite of Hassan “showed the reduction in the size of elemental nickel particulates in the extruded composites” (see Table 1 (from Hassan (above)). In other words, the extrusion in Hassan resulted in a reduction of grain size of the magnesium composite. A POSITA in April 2014 would have been motivated to combine the disclosure of Xiao with this disclosure of deformation processing in Hassan rendering Claim 7 obvious. Accordingly, Claim 7 should be found obvious over Xiao in view of Hassan.	
’740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
94. A dissolvable magnesium cast composite comprising				The preamble does not identify any limitations so that none of the references cited by defendants

				are relevant. Alternatively, none of the cited references disclose a magnesium composite that includes in situ precipitation of galvanically- active intermetallic phases to enable controlled dissolution of said magnesium composite.
’740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
a mixture of magnesium or a magnesium alloy and an additive material,	Xiao discloses a “magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy...” ¶ 0026, ll. 1-3. Thus, this claim element was anticipated by Xiao.			None of the references recite this limitation.
said additive material includes a) nickel wherein said nickel constitutes 0.01-5 wt. % of said dissolvable magnesium cast composite or b) nickel wherein said nickel constitutes		Xiao discloses a “Example 1 The composition of the alloy and the respective percentages by weight are as follows: 13% Al-2% Zn-0.1% Fe-5% Ni-2.5% Ag-0.5% Ti-0.5% Zr, and the remainder is Mg.” Xiao ¶¶ 0033-0035. Xiao discloses a “Example 2 The composition of the alloy and the respective percentages		None of the references recite this limitation.

0.1-23.5 wt. % of said dissolvable magnesium cast composite,		by weight are as follows: 20% Al-10% Zn-5% Fe-2.5% Ni-2.5% Cu-5% Ag-0.25% Ti-0.25% Zr, and the remainder is Mg." Xiao ¶¶ 0037-0039. Xiao discloses a "Example 3 The composition of the alloy and the respective percentages by weight are as follows: 20% Al-10% Zn-5% Fe-2.5% Ni-2.5% Cu-5% Ag-0.25% Ti-0.25% Zr, and the remainder is Mg." Xiao ¶¶ 0041-0043. Xiao discloses a "Example 4 The composition of the alloy and the respective percentages by weight are as follows: 18% Al-8% Zn-2.5% Fe-2.0% Ni-5% Cu-1% Ag-0.3% Ti-0.15% Zr, and the remainder is Mg." Xiao ¶¶ 0045-0047. A POSITA in August 2014 would have understood this disclosure to mean "additive material includes a) nickel wherein said nickel constitutes 0.01-5 wt. % of said dissolvable magnesium cast composite or b) nickel wherein said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite." Thus, this claim element was rendered obvious by Xiao.		

'740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
said dissolvable magnesium cast composite includes in situ precipitate,	Xiao discloses a "purpose of adding the high content of aluminum content is to produce a large amount of cathode phase, the B ($Mg_{17}Al_{12}$) phase and eutectic phase ...." Xiao ¶ 0026. Thus, this claim element was anticipated by Xiao.			None of the references recite this limitation.
said in situ precipitate includes said additive material,	Xiao discloses a "purpose of adding the high content of aluminum content is to produce a large amount of cathode phase, the B ($Mg_{17}Al_{12}$) phase and eutectic phase ...." Xiao ¶ 0026. Thus, this claim element was anticipated by Xiao.			None of the references recite this limitation.
said dissolvable magnesium cast composite has a dissolution rate of at least 75 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	Xiao discloses "a magnesium alloy ... is to produce a large amount of cathode phase, the B (Mgi7Al12) phase and eutectic phase on the grain boundary of the magnesium alloy, and the magnesium matrix o phase functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy			None of the references recite this limitation.

	form a large amount of micro-batteries, which greatly accelerate the corrosion decomposition of magnesium alloy." Xiao ¶ 0026. Further, Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. Thus, this claim element was anticipated by Xiao.			
’740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
95. The dissolvable magnesium cast composite as defined in claim 94, wherein said dissolvable magnesium cast composite includes no more than 10 wt. % aluminum.	Xiao discloses a "Example 1 The composition of the alloy and the respective percentages by weight are as follows: 13% Al-2% Zn-0.1% Fe-5% Ni-2.5% Ag-0.5% Ti-0.5% Zr, and the remainder is Mg." Xiao ¶¶ 0033-0035. Xiao discloses a "Example 2 The composition of the alloy and the respective percentages by weight are as follows: 20% Al-10% Zn-5% Fe-2.5% Ni-2.5% Cu-5% Ag-0.25% Ti-0.25% Zr, and the remainder is Mg." Xiao ¶¶ 0037-0039.	Xiao discloses a "Example 1 The composition of the alloy and the respective percentages by weight are as follows: 13% Al-2% Zn-0.1% Fe-5% Ni-2.5% Ag-0.5% Ti-0.5% Zr, and the remainder is Mg." Xiao ¶¶ 0033-0035. Xiao discloses a "Example 2 The composition of the alloy and the respective percentages by weight are as follows: 20% Al-10% Zn-5% Fe-2.5% Ni-2.5% Cu-5% Ag-0.25% Ti-		None of the references recite this limitation.

	Xiao discloses a "Example 3 The composition of the alloy and the respective percentages by weight are as follows: 20% Al-10% Zn-5% Fe-2.5% Ni-2.5% Cu-5% Ag-0.25% Ti-0.25% Zr, and the remainder is Mg." Xiao ¶¶ 0041-0043. Xiao discloses a "Example 4 The composition of the alloy and the respective percentages by weight are as follows: 18% Al-8% Zn-2.5% Fe-2.0% Ni-5% Cu-1% Ag-0.3% Ti-0.15% Zr, and the remainder is Mg." Xiao ¶¶ 0045-0047. A POSITA in August 2014 would have understood this disclosure to mean "additive material includes a) nickel wherein said nickel constitutes 0.01-5 wt. % of said dissolvable magnesium cast composite or b) nickel wherein said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite." Thus, this claim element was anticipated by Xiao.	0.25% Zr, and the remainder is Mg." Xiao ¶¶ 0037-0039. Xiao discloses a "Example 3 The composition of the alloy and the respective percentages by weight are as follows: 20% Al-10% Zn-5% Fe-2.5% Ni-2.5% Cu-5% Ag-0.25% Ti-0.25% Zr, and the remainder is Mg." Xiao ¶¶ 0041-0043. Xiao discloses a "Example 4 The composition of the alloy and the respective percentages by weight are as follows: 18% Al-8% Zn-2.5% Fe-2.0% Ni-5% Cu-1% Ag-0.3% Ti-0.15% Zr, and the remainder is Mg." Xiao ¶¶ 0045-0047. A POSITA in August 2014 would have understood this disclosure to mean "additive material includes a) nickel wherein said nickel constitutes 0.01-5 wt. % of said dissolvable magnesium cast composite or b) nickel wherein said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite." Thus, this claim element was rendered obvious by Xiao.		
’740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al.**	**Terves’ Response**

			<u>**in view of Hassan, Development of High Strength Mag…**</u>	
96. The dissolvable magnesium cast composite as defined in claim 94, wherein said dissolvable magnesium composite cast includes at least 85 wt. % magnesium.	Xiao discloses a "Example 1 The composition of the alloy and the respective percentages by weight are as follows: 13% Al-2% Zn-0.1% Fe-5% Ni-2.5% Ag-0.5% Ti-0.5% Zr, and the remainder is Mg." Xiao ¶¶ 0033-0035. Xiao discloses a "Example 2 The composition of the alloy and the respective percentages by weight are as follows: 20% Al-10% Zn-5% Fe-2.5% Ni-2.5% Cu-5% Ag-0.25% Ti-0.25% Zr, and the remainder is Mg." Xiao ¶¶ 0037-0039. Xiao discloses a "Example 3 The composition of the alloy and the respective percentages by weight are as follows: 20% Al-10% Zn-5% Fe-2.5% Ni-2.5% Cu-5% Ag-0.25% Ti-0.25% Zr, and the remainder is Mg." Xiao ¶¶ 0041-0043. Xiao discloses a "Example 4 The composition of the alloy and the respective percentages by weight are as follows: 18% Al-8% Zn-2.5% Fe-2.0% Ni-5% Cu-1% Ag-0.3% Ti-0.15% Zr, and the remainder is Mg." Xiao ¶¶ 0045-0047. A POSITA in August 2014 would have understood this disclosure to mean "additive material includes a) nickel wherein said nickel constitutes 0.01-5 wt. % of said	Xiao discloses a "Example 1 The composition of the alloy and the respective percentages by weight are as follows: 13% Al-2% Zn-0.1% Fe-5% Ni-2.5% Ag-0.5% Ti-0.5% Zr, and the remainder is Mg." Xiao ¶¶ 0033-0035. Xiao discloses a "Example 2 The composition of the alloy and the respective percentages by weight are as follows: 20% Al-10% Zn-5% Fe-2.5% Ni-2.5% Cu-5% Ag-0.25% Ti-0.25% Zr, and the remainder is Mg." Xiao ¶¶ 0037-0039. Xiao discloses a "Example 3 The composition of the alloy and the respective percentages by weight are as follows: 20% Al-10% Zn-5% Fe-2.5% Ni-2.5% Cu-5% Ag-0.25% Ti-0.25% Zr, and the remainder is Mg." Xiao ¶¶ 0041-0043. Xiao discloses a "Example 4 The composition of the alloy and the respective percentages by weight are as follows: 18% Al-8% Zn-2.5% Fe-2.0% Ni-5% Cu-1% Ag-0.3% Ti-0.15% Zr, and the remainder is Mg." Xiao ¶¶ 0045-0047.		None of the references recite this limitation.

	dissolvable magnesium cast composite or b) nickel wherein said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite." Thus, this claim element was anticipated by Xiao.	A POSITA in August 2014 would have understood this disclosure to mean "additive material includes a) nickel wherein said nickel constitutes 0.01-5 wt. % of said dissolvable magnesium cast composite or b) nickel wherein said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite." Thus, this claim element was rendered obvious by Xiao.		
'740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves' Response**
97. The dissolvable magnesium cast composite as defined in claim 95, wherein said dissolvable magnesium cast composite includes at least 85 wt. % magnesium.	Xiao discloses a "Example 1 The composition of the alloy and the respective percentages by weight are as follows: 13% Al-2% Zn-0.1% Fe-5% Ni-2.5% Ag-0.5% Ti-0.5% Zr, and the remainder is Mg." Xiao ¶¶ 0033-0035. Xiao discloses a "Example 2 The composition of the alloy and the respective percentages by weight are as follows: 20% Al-10% Zn-5% Fe-2.5% Ni-2.5% Cu-5% Ag-0.25% Ti-0.25% Zr, and the remainder is Mg." Xiao ¶¶ 0037-0039. Xiao discloses a "Example 3 The composition of the alloy and the respective percentages by weight	Xiao discloses a "Example 1 The composition of the alloy and the respective percentages by weight are as follows: 13% Al-2% Zn-0.1% Fe-5% Ni-2.5% Ag-0.5% Ti-0.5% Zr, and the remainder is Mg." Xiao ¶¶ 0033-0035. Xiao discloses a "Example 2 The composition of the alloy and the respective percentages by weight are as follows: 20% Al-10% Zn-5% Fe-2.5% Ni-2.5% Cu-5% Ag-0.25% Ti-0.25% Zr, and the remainder is Mg." Xiao ¶¶ 0037-0039.		None of the references recite this limitation.

	are as follows: 20% Al-10% Zn-5% Fe-2.5% Ni-2.5% Cu-5% Ag-0.25% Ti-0.25% Zr, and the remainder is Mg." Xiao ¶¶ 0041-0043. Xiao discloses a "Example 4 The composition of the alloy and the respective percentages by weight are as follows: 18% Al-8% Zn-2.5% Fe-2.0% Ni-5% Cu-1% Ag-0.3% Ti-0.15% Zr, and the remainder is Mg." Xiao ¶¶ 0045-0047. A POSITA in August 2014 would have understood this disclosure to mean "additive material includes a) nickel wherein said nickel constitutes 0.01-5 wt. % of said dissolvable magnesium cast composite or b) nickel wherein said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite." Thus, this claim element was anticipated by Xiao.	Xiao discloses a "Example 3 The composition of the alloy and the respective percentages by weight are as follows: 20% Al-10% Zn-5% Fe-2.5% Ni-2.5% Cu-5% Ag-0.25% Ti-0.25% Zr, and the remainder is Mg." Xiao ¶¶ 0041-0043. Xiao discloses a "Example 4 The composition of the alloy and the respective percentages by weight are as follows: 18% Al-8% Zn-2.5% Fe-2.0% Ni-5% Cu-1% Ag-0.3% Ti-0.15% Zr, and the remainder is Mg." Xiao ¶¶ 0045-0047. A POSITA in August 2014 would have understood this disclosure to mean "additive material includes a) nickel wherein said nickel constitutes 0.01-5 wt. % of said dissolvable magnesium cast composite or b) nickel wherein said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite." Thus, this claim element was rendered obvious by Xiao.		
’740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**

'740 Patent Claims	Anticipated by CN 103343271 A Xiao et al.	At Least Made Obvious By CN 103343271 A	Obvious over CN 103343271 A Xiao et al.	Terves' Response
98. The dissolvable magnesium cast composite as defined in claim 94, wherein said dissolvable magnesium cast composite has a dissolution rate of 75-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	Xiao discloses "a magnesium alloy … is to produce a large amount of cathode phase, the B ($Mg_{17}Al_{12}$) phase and eutectic phase on the grain boundary of the magnesium alloy, and the magnesium matrix o phase functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which greatly accelerate the corrosion decomposition of magnesium alloy." Xiao ¶ 0026. Further, Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. Thus, this claim element was anticipated by Xiao.	Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. Further, Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. A POSITA in August 2014 would have understood this disclosure to mean "dissolvable magnesium cast composite has a dissolution rate of 75-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." Thus, this claim element was rendered obvious by Xiao.		None of the references recite this limitation.

		Xiao et al.	in view of Hassan, Development of High Strength Mag...	
99. The dissolvable magnesium cast composite as defined in claim 97, wherein said dissolvable magnesium cast composite has a dissolution rate of 75-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	Xiao discloses "a magnesium alloy ... is to produce a large amount of cathode phase, the B ($Mg_{17}Al_{12}$) phase and eutectic phase on the grain boundary of the magnesium alloy, and the magnesium matrix o phase functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which greatly accelerate the corrosion decomposition of magnesium alloy." Xiao ¶ 0026. Further, Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. Thus, this claim element was anticipated by Xiao.	Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. Further, Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. A POSITA in August 2014 would have understood this disclosure to mean "dissolvable magnesium cast composite has a dissolution rate of 75-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C."		None of the references recite this limitation.

		Thus, this claim element was rendered obvious by Xiao.		
’740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**
100. The dissolvable magnesium cast composite as defined in claim 94, wherein said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite.		Xiao discloses a “light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg.” Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean “nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite.” It would have been obvious to a PHOSITA to include 0.1-23.5 wt. % Ni. Thus, this claim element was rendered obvious by Xiao.		None of the references recite this limitation.
’740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...**	**Terves’ Response**

101. The dissolvable magnesium cast composite as defined in claim 99, wherein said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite." It would have been obvious to a PHOSITA to include 0.1-23.5 wt. % Ni. Thus, this claim element was rendered obvious by Xiao.		None of the references recite this limitation.
<u>'740 Patent Claims</u>	**<u>Anticipated by CN 103343271 A Xiao et al.</u>**	**<u>At Least Made Obvious By CN 103343271 A Xiao et al.</u>**	**<u>Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag...</u>**	**<u>Terves' Response</u>**
102. The dissolvable magnesium cast composite as defined in claim 94, wherein said dissolvable magnesium cast composite has one		Xiao discloses "a magnesium alloy with a high aluminum content (13 to 25% by weight) and a high zinc content (2 to 10% by weight), and further adds elements of Fe, Cu, Ni and Ag which can enhance the corrosion performance of the magnesium alloy, and at the	As set forth in Ground I, supra, Xiao already discloses each and every element of the magnesium composition of Claim 1. Xiao does not disclose subjecting that magnesium composite to deformation processing.	None of the references recite this limitation.

or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.		same time adds Zr, Ti element as grain refiners to improve the compressive strength of the formed material, ... The purpose of adding a high content of zinc to the magnesium alloy is to increase the strength of the magnesium alloy, ... The addition of the trace elements Zr and Ti can refine the magnesium alloy crystals, thereby increasing the compressive strength of the alloy. The room temperature tensile strength op of the light and pressure-proof fast-decomposed cast magnesium alloy prepared by the invention is 130 to 180 MPa higher than that of the existing AZ91D magnesium alloy, ...” Xiao at ¶ 0026. A POSITA in August 2014 would have understood this disclosure to mean “has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.” Thus, this claim element was rendered obvious by Xiao.	Hassan explicitly discloses deformation processing. In particular, Hassan discloses that the deposited magnesium ingots may then be subjected to secondary processing. For example, Hassan teaches that the nickel-reinforced magnesium ingots are machined and hot extruded to obtain rods of 8 mm diameter. Id. Analysis of the composite of Hassan “showed the reduction in the size of elemental nickel particulates in the extruded composites” (see Table 1 (from Hassan (above)). In other words, the extrusion in Hassan resulted in a reduction of grain size of the magnesium composite. A POSITA in April 2014 would have been motivated to combine the disclosure of Xiao with this disclosure of deformation processing in Hassan rendering Claim 7 obvious. Accordingly, Claim 7 should be found obvious over Xiao in view of Hassan.	
’740 Patent Claims	**Anticipated by CN 103343271 A Xiao et al.**	**At Least Made Obvious By CN 103343271 A Xiao et al.**	**Obvious over CN 103343271 A Xiao et al.**	**Terves’ Response**

			in view of Hassan, Development of High Strength Mag...	
103. The dissolvable magnesium cast composite as defined in claim 101, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.		Xiao discloses "a magnesium alloy with a high aluminum content (13 to 25% by weight) and a high zinc content (2 to 10% by weight), and further adds elements of Fe, Cu, Ni and Ag which can enhance the corrosion performance of the magnesium alloy, and at the same time adds Zr, Ti element as grain refiners to improve the compressive strength of the formed material, ... The purpose of adding a high content of zinc to the magnesium alloy is to increase the strength of the magnesium alloy, ... The addition of the trace elements Zr and Ti can refine the magnesium alloy crystals, thereby increasing the compressive strength of the alloy. The room temperature tensile strength σb of the light and pressure-proof fast-decomposed cast magnesium alloy prepared by the invention is 130 to 180 MPa higher than that of the existing AZ91D magnesium alloy, ..." Xiao at ¶ 0026.	As set forth in Ground I, supra, Xiao already discloses each and every element of the magnesium composition of Claim 1. Xiao does not disclose subjecting that magnesium composite to deformation processing. Hassan explicitly discloses deformation processing. In particular, Hassan discloses that the deposited magnesium ingots may then be subjected to secondary processing. For example, Hassan teaches that the nickel-reinforced magnesium ingots are machined and hot extruded to obtain rods of 8 mm diameter. Id. Analysis of the composite of Hassan "showed the reduction in the size of elemental nickel particulates in the extruded composites" (see Table 1 (from Hassan (above)). In other words, the extrusion in Hassan resulted in a reduction of grain size of the magnesium composite. A POSITA in April 2014 would have been motivated to combine the disclosure of Xiao with this disclosure of	None of the references recite this limitation.

		A POSITA in August 2014 would have understood this disclosure to mean "has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%." Thus, this claim element was rendered obvious by Xiao.	deformation processing in Hassan rendering Claim 7 obvious. Accordingly, Claim 7 should be found obvious over Xiao in view of Hassan.	